B.P.S. MAHILA VISHWAVIDYALAYA
KHANPUR KALAN
SONIPAT-131305

B.P.S. INSTITUTE OF HIGHER LEARNING

Curriculum and Scheme of Examinations
of
Three Year Degree Course

B.A./B.Sc.

Subject: ENGLISH (Pass Course)
(w.e.f. July, 2022)

Programme Code – 053,054,055,057

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Programme Outcomes

The programme is designed and taught to accomplish the following outcomes:

PO-1-Developing interest and basic understanding for English literature and language.

PO-2-Fostering linguistic and communicative competence in the learners.

PO-3 Enabling the learners to critically appreciate different genres of English Literature.

PO-4 Facilitating the learner to undertake post-graduation in English Literature and language.

PO-5 Promoting an intertextual and inter literary understanding of local literature and culture in English translation.

COURSE CURRICULUM & SCHEME OF EXAMINATIONS (ENGLISH)
FOR
B.A./B.SC. 3 YEAR DEGREE COURSE

(w.e.f. July 2022)

Scheme of Examination of 1st – 6th Semester

Semester	Code	Paper Title	Hours Per Week			Marks Distribution		
			L	T+P	Total Credits	Internal Marks	External Marks	Total
1	ENG-101	ENGLISH	6	2	6	20	80	100
2	ENG-102	ENGLISH	6	2	6	20	80	100
3	ENG-201	ENGLISH	6	2	6	20	80	100
4	ENG-202	ENGLISH	6	2	6	20	80	100
5	ENG-301	ENGLISH	6	2	6	20	80	100
6	ENG-302	ENGLISH	6	2	6	20	80	100
Total Contact Hours/Credits			36	12	36	120	480	600

Pass Percentage — 40% and above- Both in External and Internal examination separately.

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CONSOLIDATED PROGRAMME DETAILS

Sr. No.	Semester	Total Credits	Total Marks
1	I	6	100
2	II	6	100
3	III	6	100
4	IV	6	100
5	V	6	100
6	VI	6	100
TOTAL CREDITS/MARKS		**36**	**600**

CORRECTIONS IN THE ORDINANCE

(w.e.f. July, 2022)

Evaluation and Grading:

The assessment will be 20% internal and 80% external.
The students have to qualify internal as well as external tests separately**.**
The weightage for internal evaluation (20%) is as follows:

Class tests/Minor test/Sessional tests	10%	(10 marks out of 100)
Assignments/Presentations/Seminars/Group Discussions	5%	(05 marks out of 100)
Attendance	5%	(05 marks out of 100)

Distribution of Marks for Attendance

75% to 80%	2 Marks
80% to 85 %	3 Marks
85% and above	5 Marks

Note: The Internal Evaluation of 15 Marks (except attendance) in English will be based on Listening and Speaking Skills.

Credits:

The **classes/periods** in BPSIHL (Formerly BPSM Girls' College) are of **45 Minutes** each. So, the **6 credits** in each semester refer to **6+2 = 8 classes/periods**.

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Title of the Paper: English Paper Code: ENG-101 Credits: 6

B.A. - I SEMESTER

Unit I

A Brief Introduction to Literature: FICTION for Semester - I

Various Genres of Literature under Study (Semesters 1-6) will be introduced briefly to the students along with the names of the famous propagators of concerned genres. In Semester I, students will be introduced to Fiction. (Matter Prescribed)

Note: This Chapter is restricted to MCQs only.

Short Stories – 4 Stories

1. 'Three Questions' by Leo Tolstoy
   (A. Sujatha (ed.), *Effective English II,* BPSMV)
2. 'After Twenty Years' by O Henry
   (Amrita Sharma (ed.), *Effective English IV* , BPSMV)
3. 'The Refugees' by Pearl S. Buck
   (Usha Bande and Krishan Gopal (ed.), *The Pointed Vision*, O.U.P.)
4. 'The Bet' by Anton Chekhov (From Effective English I & II)
   (Usha Bande and Krishan Gopal (ed.), *The Pointed Vision*, O.U.P.)

Unit II

Short Stories – 4 Stories (Indian Writers)

1. 'The Blind Dog' by R.K. Narayan
   (Jaiveer Hooda, Randeep Rana, Loveleen Mohan (ed.) *Language and Literature II,* Orient BlackSwan)
2. **'**The Child' by Premchand

(Jaiveer Hooda, Randeep Rana, Loveleen Mohan (ed.) *Language and Literature II,* Orient BlackSwan)

3. **'**The Mark of Vishnu' by Khushwant Singh
   (Suman Dalal (ed.), *Effective English I* , BPSMV)
4. **'**Pigeons at Daybreak' by Anita Desai

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(Jaiveer Hooda, Randeep Rana, Loveleen Mohan (ed.) *Language and Literature II,* Orient BlackSwan)

Unit III

Grammar

1. Sentence and Types of Sentences: Affirmative, Negative, Interrogative. (Changing from Affirmative to Negative to Interrogative etc.)
2. Parts of Speech: Brief Introduction of all Parts of Speech
3. Adjectives
4. Adverbs

Unit IV

Vocabulary & Writing

1. Synonyms and Antonyms - Commonly Used: (List Prescribed in compendium IHL)
2. Paragraph Writing: Developing a Paragraph with the help of 'hints' given (Hint Development)
3. Punctuation Marks

Suggested /Recommended Reading for Semester I & II

1) Asha Kadyan (ed.), *Chronicles of Time,* O.U.P.
2) Dinesh Kumar and V.B. Abrol (ed.), *Ideas Aglow,* Publication Bureau, K.U.Kurukshetra
3) Raymond Murphy, *Murphy's English Grammar,* C.U.P
4) N. Krishnaswamy, *Modern English,* Macmillan India
5) *Oxford Advanced Learners' Dictionary*, O.U.P.

Course Outcomes:

CO1-Understanding stories (FICTION) as a literary genre

CO2- Enhancing grammatical competence using stories

CO3- Appreciation of life as reflected in stories

CO4- Developing story writing as one of the hobbies

CO5- Story telling: an effective communicative tool

INSTRUCTIONS TO THE EXAMINER

Title of the Paper: English **Paper Code: ENG-101** **Credits:6**
Time: 3 Hours **Max. Marks: 80**

Note: The student will be required to attempt 5 Questions in all, one from each of the 4 Sections (A,B,C,D).
Question No. 1 (inclusive of all 4 Units) is compulsory.

Question No. 1
The Students will be required to attempt 16 Multiple Choice Questions (Each of One Mark) from all the 4 Units. (16 Marks)

SECTION – A

Question No. 2

i) Explanation with reference to the context. The Students will be required to attempt one passage from the prescribed Stories. (8)

ii) Short Answer Type questions based on the stories prescribed. (8)

Question No. 3

i) Comprehension questions based on a paragraph from the prescribed stories. (8)

ii) One long (essay type) question of about 150 words from the prescribed stories. (8)

SECTION – B

Question No. 4

i) Explanation with reference to the context. The Students will be required to attempt one passage from the prescribed stories. (8)

ii) Short Answer Type questions based on the stories prescribed. (8)

Question No. 5

i) Comprehension questions based on a paragraph from the prescribed stories. (8)

ii) One long (essay type) question of about 150 words from the prescribed stories. (8)

SECTION – C

Question No. 6

i) Exercise on Types of Sentences (04)

ii) Exercise on Parts of Speech (04)

iii) Exercise on Adjectives (04)

iv) Exercise on Types Adverbs (04)

SECTION – D

Question No. 7

i) Exercise on Synonyms and Antonyms (Prescribed) (06)

ii) Paragraph Writing with Hints Development (05)

iii) Exercise on Punctuation (05)

Title of the Paper: English Paper Code: ENG-102 Credits: 6

B.A. - II SEMESTER

Unit I

A Brief Introduction to Literature – NON-FICTION for Semester - II

Various Genres of Literature under Study (Semesters 1-6) will be introduced briefly to the students along with the names of the famous propagators of concerned genres. In Semester II, students will be introduced to Non-Fiction. (Matter Prescribed)

Note: This Chapter is restricted to MCQs only.

Non-Fiction – 4 Essays

1. 'Attitude is Everything' by Brian Cavanaugh
   (Suman Dalal (ed.), *Effective English I* , BPSMV)
2. 'My Financial Career' by Stephen Leacock
   (Suman Dalal (ed.), *Effective English I* , BPSMV)
3. 'The Generation Gap' by Benjamin Spock
   (Loveleen Mohan, Randeep Rana, Jaiveer Hooda (ed.) *Language and Literature I,* Orient BlackSwan)
4. 'How to Avoid an Argument' by Sam Horn
   (Amrita Sharma (ed.), *Effective English IV*, BPSMV)

Unit II

Non-Fiction – 4 Essays/Speeches (Indian Writers)

1. 'Mind and Meditation' by Sri Sri Ravi Shankar (http://www.huffingtonpost.com)

2. 'Address to the Students of IIT-Hyderabad' by APJ Abdul Kalam (http://www.youthconnect.in)
3. 'The Responsibility of Young Men' by Lal Bahadur Shastri
   (Loveleen Mohan, Randeep Rana, Jaiveer Hooda (ed.) *Language and Literature I,* Orient BlackSwan)
4. **'**Public Transport in London and Delhi by Nirad C. Chaudhuri (A Sujata (ed.) Effective English II, BPSMV)

Unit III

Grammar

1. Tenses
2. Articles

Unit IV

Vocabulary & Writing

1. Words Describing Weather (List Prescribed)
2. Words Describing Feelings (List Prescribed)
3. Report Writing with Hints (Reports on events and incidents such as a function in college, an accident you saw on the way etc.)
4. Letter Writing – Leave Letter, Informal Letter

Suggested /Recommended Reading for Semester I & II

6) Asha Kadyan (ed.), *Chronicles of Time*, O.U.P.
7) Usha Bande and Krishan Gopal (ed.), *The Pointed Vision*, O.U.P.
8) Dinesh Kumar and V.B. Abrol (ed.), *Ideas Aglow*, Publication Bureau, K.U.Kurukshetra
9) Raymond Murphy, *Murphy's English Grammar,* C.U.P
10) N. Krishnaswamy, *Modern English,* Macmillan India
11) *Oxford Advanced Learners' Dictionary*, O.U.P.

Course Outcomes

CO1- Understanding NON-FICTION as a literary genre

CO2- Enhancing grammatical competence through essays/articles/speeches

CO3- Appreciation of life as reflected in selected essays/prose

CO4- Learning paragraph writing using cohesion and coherence

CO5- Promoting national integration through essays on iconic figures

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INSTRUCTIONS TO THE EXAMINER

Title of the Paper: English **Paper Code: ENG-102** **Credits: 6**
Time: 3 Hours **Max. Marks: 80**

Note: The student will be required to attempt 5 Questions in all, one from each of the 4 Sections (A,B,C,D).
Question No. 1 (inclusive of all 4 Units) is compulsory.

Question No. 1
The Students will be required to attempt 16 Multiple Choice Questions (Each of One Mark) from all the 4 Units. (16 Marks)

SECTION – A

Question No. 2

i) Explanation with reference to the context. The Students will be required to attempt one passage from the prescribed essays. (8)

ii) Short Answer Type questions based on the essays prescribed. (8)

Question No. 3

i) Comprehension questions based on a paragraph from the prescribed essays. (8)

ii) One long (essay type) question of about 150 words from the prescribed essays. (8)

SECTION – B

Question No. 4

i) Explanation with reference to the context. The Students will be required to attempt one passage from the prescribed essays. (8)

ii) Short Answer Type questions based on the essays prescribed. (8)

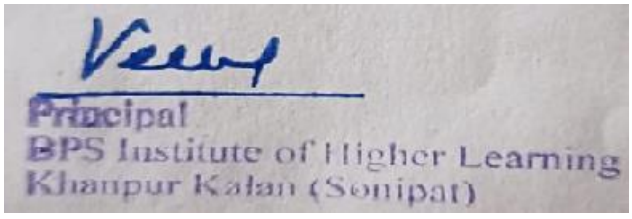
Question No. 5

i) Comprehension questions based on a paragraph from the prescribed essays. (8)

ii) One long (essay type) question of about 150 words from the prescribed essays. (8)

SECTION – C

Question No. 6
Exercise on Tenses (10)
Exercise on Articles (06)



SECTION – D

Question No. 7

Exercise on Words Describing Weather and Feelings- Prescribed (06)
Report Writing (05)
Letter Writing (05)

Title of the Paper: English Paper Code: ENG-201 Credits: 6

B.A. - III SEMESTER

Unit I

A Brief Introduction to Literature: POETRY for Semester - III

Various Genres of Literature under Study (Semesters 1-6) will be introduced briefly to the students along with the names of the famous propagators of concerned genres. In Semester III, students will be introduced to Poetry. (Matter Prescribed)

Note: This Chapter is restricted to MCQs only.

Poetry– 4 Poems

5. 'All the World is a Stage' by William Shakespeare

(A. Sujatha (ed.) , Effective English II, BPSMV)

6. 'The Road Not Taken' by Robert Frost

(Ravi Bhushan (ed.), *Effective English III*, BPSMV)

7. 'The Lost Mistress' by Robert Browning

(Asha Kadyan (ed.), Chronicles of Time, O.U.P.)

8. 'Woman Work' by Maya Angelou (http://www.allpoetry.com)

Unit II

Poetry– 4 Poems (Indian Poets)

5. 'Where the Mind is Without Fear' by Rabindranath Tagore

(Asha Kadyan (ed.), Chronicles of Time, O.U.P.)

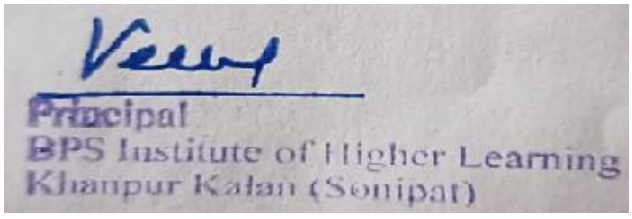
6. **'**The Palanquin Bearers' by Sarojini Naidu

(Suman Dalal (ed.), Effective English I, BPSMV)

7. **'**Woman' by Hira Bansode

(Ravi Bhushan (ed.), *Effective English III*, BPSMV)

8. 'Evil' by Dinesh Kumar (P.Gopichand & P.Nagasuseela (ed.) *A Posy of Poesy*,DDS Multimedia, Guntur)



Unit III

Grammar

1. Active Voice and Passive Voice
2. Prepositions

Unit IV

Vocabulary & Writing

1. Idioms – Related to Colours (List Prescribed)
2. Idioms – Related to Culture (List Prescribed)
3. Letter Writing – Orders and Complaints
4. Writing Agendas of a Meeting

Suggested /Recommended Reading for Semester III & IV

1) Amrita Sharma (ed.), *Effective English IV,* BPSMV
2) S.S. Sangwan (ed.), *Sounds of Stillness*, O.U.P.
3) C.Rajgopalachari, *Mahabharata,* Bharatiya Vidya Bhavan
4) S.K.Sharma (ed.), *Snapshots,* O.U.P.
5) Raymond Murphy, *Murphy's English Grammar,* C.U.P.
6) N. Krishnaswamy, *Modern English,* Macmillan India
7) *Oxford Advanced Learners' Dictionary*, O.U.P.

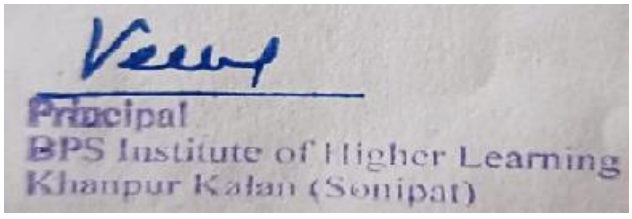
INSTRUCTIONS TO THE EXAMINER

Title of the Paper: English **Paper Code: ENG-201** **Credits:6**
Time: 3 Hours **Max. Marks: 80**

Note: The student will be required to attempt 5 Questions in all, one from each of the 4 Sections (A,B,C,D).
Question No. 1 (inclusive of all 4 Units) is compulsory.

Question No. 1

The Students will be required to attempt 16 Multiple Choice Questions (Each of One Mark) from all the 4 Units. (16 Marks)



SECTION – A

Question No. 2

i) Explanation with reference to the context. The Students will be required to attempt one stanza from the prescribed poems. (8)

ii) Short Answer Type questions based on the poems prescribed. (8)

Question No. 3

iii) Comprehension questions based on a stanza from the prescribed poems. (8)

iv) One long (essay type) question of about 150 words from the prescribed poems. (8)

SECTION – B

Question No. 4

i) Explanation with reference to the context. The Students will be required to attempt one stanza from the prescribed poems. (8)

ii) Short Answer Type questions based on the poems prescribed. (8)

Question No. 5

i) Comprehension questions based on a stanza from the prescribed poems. (8)

ii) One long (essay type) question of about 150 words from the prescribed poems. (8)

SECTION – C

Question No. 6

i) Exercise on Active and Passive Voice (8)

ii) Exercise on Prepositions (8)

SECTION – D

Question No. 7

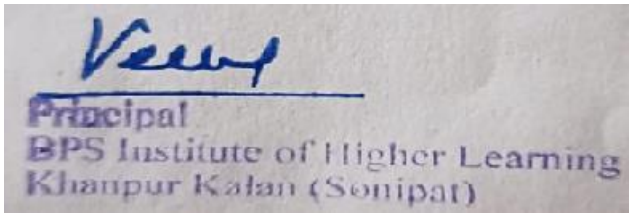
i) Exercise on Idioms (Colour and Culture) (6)

ii) Letter Writing (Orders and Complaints) (5)

iii) Writing Agendas (5)

Course Outcomes

CO1-Understanding POETRY as a literary genre



CO2- Enhancing aesthetic competence through poetry

CO3- Understanding use of figurative devices

CO4- Developing poetry writing as one of the hobbies

CO5- Enhancing grammatical competence through poetry

Title of the Paper: English Paper Code: ENG-202 Credits: 6

B.A. - IV SEMESTER

Unit I

A Brief Introduction to Literature: DRAMA/PLAY for Semester - IV

Various Genres of Literature under Study (Semesters 1-6) will be introduced briefly to the students along with the names of the famous propagators of concerned genres. In Semester IV, students will be introduced to Drama. (Matter Prescribed)

Note: This Chapter is restricted to MCQs only.

One Act Plays – 3 Plays

8) 'Refund' by Fritz Karinthy (Ravi Bhushan (ed.), *Effective English III*, BPSMV)

9) 'Never-Never Nest' by Cedric Mount (Ravi Bhushan (ed.), *Effective English III*, BPSMV)

10) 'Mother's Day' by J.B. Priestly (S.K.Sharma (ed.), *Snapshots,* O.U.P.)

Unit II

One Act Plays – 3 Plays (Indian Playwrights)

1. 'Chandalika' by Rabindranath Tagore (Satish Gupta (ed.) *Five One Act Plays*, Natraj Publishing House, Karnal)
2. 'The Envoy' (Duta Vakyam) by Bhasa (Bhasa *The Shattered Thigh and Other Plays,*Translated by A.N.D. Haksar, Penguin Books, 2008)
3. 'ASOKA: The King Who Turned Non-Violent' by Christine Ribeiro (Christine Ribeiro, *Eight Moral Plays,* BYB, Mumbai, 2006)

Unit III

Grammar

1. Narration (Direct and Indirect Speech)

2. Conjunctions

Unit IV

Vocabulary & Writing

1. Homonyms- (Homophones and Homographs) Commonly Used (List Prescribed)
2. Recommendations and Suggestions on current Social Problems (Problems like Domestic Violence, Smoking in Public Places, Indiscipline Among Students, Female Foeticide etc.)
3. Writing Minutes of a Meeting

Suggested /Recommended Reading for Semester III & IV

1) Amrita Sharma (ed.), *Effective English IV,* BPSMV
2) S.S. Sangwan (ed.), *Sounds of Stillness*, O.U.P.
3) C.Rajgopalachari, *Mahabharata,* Bharatiya Vidya Bhavan
4) Dinesh Kumar, Sunita Siroha, Sukhvinder Singh (ed.) *Fragrances***,** Orient BlackSwan
5) Raymond Murphy, *Murphy's English Grammar,* C.U.P.
6) N. Krishnaswamy, *Modern English,* Macmillan India
7) *Oxford Advanced Learners' Dictionary*, O.U.P.

Course Outcomes

CO1-Understanding One Act Play as a literary genre

CO2- Enhancing grammatical competence through dialogues

CO3- Learning dramatic devices and techniques

CO4- Promoting Inter-cultural aesthetics through plays in translation

CO5- Plays as a potent tool for communication

INSTRUCTIONS TO THE EXAMINER

Title of the Paper: English **Paper Code: ENG-202** **Credits: 6**
Time: 3 Hours **Max. Marks: 80**

Note: The student will be required to attempt 5 Questions in all, one from each of the 4 Sections (A,B,C,D).
Question No. 1 (inclusive of all 4 Units) is compulsory.

Question No. 1
The Students will be required to attempt 16 Multiple Choice Questions (Each of One Mark) from all the 4 Units. (16 Marks)

SECTION – A

Question No. 2.

i) Explanation with reference to the context. The Students will be required to attempt one passage from the prescribed plays. (8)

ii) Short Answer Type questions based on the plays prescribed. (8)

Question No. 3

i) Comprehension questions based on a paragraph from the prescribed plays. (8)

ii) One long (essay type) question of about 150 words from the prescribed plays. (8)

SECTION – B

Question No. 4

i) Explanation with reference to the context. The Students will be required to attempt one passage from the prescribed plays. (8)

ii) Short Answer Type questions based on the plays prescribed. (8)

Question No. 5

i) Comprehension questions based on a paragraph from the prescribed plays. (8)

ii) One long (essay type) question of about 150 words from the prescribed plays. (8)

SECTION – C

Question No. 6

i) Exercise on Direct and Indirect Speech (8)

ii) Exercise on Conjunctions (8)

SECTION – D

Question No. 7

i) Exercise on Homonyms (Prescribed) (6)

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ii) Recommendations/Suggestions on a given Social Problem (5)

iii) Writing Minutes (5)

Title of the Paper: English Paper Code: ENG-301 Credits: 6

B.A. - V SEMESTER

Unit I

I. A brief introduction to phonetic symbols and transcription (Monosyllabic)

II. Novel –*The Invisible Man* by H.G. Wells (Chapters 1-14)

(Kiran Sikka (ed.), *Effective English V*, BPSMV)

Unit II

Novel –*The Invisible Man* by H.G. Wells (Chapters 15-28)
(Kiran Sikka (ed.), *Effective English V*, BPSMV)

Unit III

Grammar
Common Errors –

1. SV Agreement
2. Use of Pronouns
3. Parallelism
4. Comparatives

Unit IV

Vocabulary & Writing

1. Prefixes and Suffixes

2. Précis Writing

3. Writing an Email

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Suggested /Recommended Reading for Semester V & VI

1) Daisy (ed.), *Effective English VI*, BPSMV
2) M.K. Bhatnagar (ed.), *Spectrum of Life: A selection of Modern Essays,* O.U.P.
3) William Shakespeare, *Macbeth,* Macmillan
4) Raymond Murphy, *Murphy's English Grammar,* C.U.P.
5) N. Krishnaswamy, *Modern English,* Macmillan India
6) John Eastwood, *Oxford Guide to English Grammar*, O.U.P.
7) Bansal and Harrison, *Spoken English for India*, Macmillan
8) R.O.Neil, *English in Situation*, O.U.P.
9) *Oxford Advanced Learners' Dictionary*, O.U.P.

Course Outcomes

CO1-Understanding NOVEL as a literary genre

CO2- Enhancing grammatical competence through novels

CO3- Tracing the growth of novel as the social discourse

CO4- Fostering reading habits through novels

CO5- Developing Novel writing as one of the hobbies

INSTRUCTIONS TO THE EXAMINER

Title of the Paper: English **Paper Code: ENG-301** **Credits:6**
Time: 3 Hours **Max. Marks: 80**

Note: The student will be required to attempt 5 Questions in all, one from each of the 4 Sections (A,B,C,D).
Question No. 1 (inclusive of all 4 Units) is compulsory.

Question No. 1
The Students will be required to attempt 16 Multiple Choice Questions (Each of One Mark) from all the 4 Units. (16 Marks)

SECTION – A

Question No. 2

i) Short Answer Type questions based on the novel prescribed with internal choice. (8)

ii) One long (essay type) question of about 150 words from the prescribed novel with internal choice. (8)

SECTION – B

Question No. 3

i) Short Answer Type questions based on the novel prescribed with internal choice. (8)

ii) One long (essay type) question of about 150 words from the prescribed novel with internal choice. (8)

SECTION – C

Question No. 4

Exercise on Common Errors-

1. Comparatives (4)
2. SV Agreement (4)
3. Use of Pronouns (4)
4. Parallelism (4)

SECTION – D

Question No. 5

1. Exercise on Prefixes and Suffixes (6)
2. Précis Writing (5)
3. Email Writing (5)

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Title of the Paper: English Paper Code: ENG-302 Credits: 6

B.A. - VI SEMESTER

Unit I

I. Phonetic Transcription (bi-syllabic words) -for one word answers only

II. Drama – *Silence ! The Court is in Session* by Vijay Tendulkar (Act 1 & 2)

(Daisy (ed.), *Effective English VI*, BPSMV)

Unit II

Drama – *Silence ! The Court is in Session* by Vijay Tendulkar (Act 3)
(Daisy (ed.), *Effective English VI*, BPSMV)

Unit III

Grammar

Clauses (Coordinate and Subordinate)

Unit IV

Vocabulary & Writing

1. One Word Substitution (List Prescribed)
2. Preparing Resume/Curriculum Vitae (CV)
3. Writing an application

Suggested /Recommended Reading for Semester V & VI

10) Kiran Sikka (ed.), *Effective English V*, BPSMV
11) M.K. Bhatnagar (ed.), *Spectrum of Life: A selection of Modern Essays,* O.U.P.
12) William Shakespeare, *Macbeth,* Macmillan
13) Raymond Murphy, *Murphy's English Grammar,* C.U.P.
14) N. Krishnaswamy, *Modern English,* Macmillan India
15) John Eastwood, *Oxford Guide to English Grammar*, O.U.P.
16) Bansal and Harrison, *Spoken English for India*, Macmillan
17) R.O.Neil, *English in Situation*, O.U.P.

18) *Oxford Advanced Learners' Dictionary*, O.U.P.

Course Outcomes

CO1-Understanding DRAMA as a literary genre

CO2- Enhancing grammatical competence through Drama

CO3- Revisiting Cultural ethos through select drama

CO4- Drama tools and techniques

CO5- Developing theatre skills

INSTRUCTIONS TO THE EXAMINER

Title of the Paper: English **Paper Code: ENG-302** **Credits:6**
Time: 3 Hours **Max. Marks: 80**

Note: The student will be required to attempt 5 Questions in all, one from each of the 4 Sections (A,B,C,D).

Question No. 1 (inclusive of all 4 Units) is compulsory.

Question No. 1

The Students will be required to attempt 16 Multiple Choice Questions (Each of One Mark) from all the 4 Units. (16 Marks)

SECTION – A

Question No. 2

iii) Short Answer Type questions based on the drama prescribed with internal choice. (8)

iv) One long (essay type) question of about 150 words from the prescribed drama with internal choice. (8)

SECTION – B

Question No. 3

iii) Short Answer Type questions based on the drama prescribed with internal choice. (8)

iv) One long (essay type) question of about 150 words from the prescribed drama with internal choice. (8)

SECTION – C

Question No. 4

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Exercise on Clauses (16)

SECTION – D

Question No. 5

4. Exercise on One Word Substitution (6)
5. Resume Writing (5)
6. Application for a Post (5)

B.P.S. Mahila Vishwavidyalaya, Khanpur Kalan

(Sonipat-131305)

BPS, Institute of Higher Learning

Curriculum and Scheme of Examination of Three year

Department of Mathematics

B. Sc. (Mathematics)

(w.e.f. July, 2022)

B.Sc. (Non-Medical) Programme Code – 055
B.Sc. (Computer Science) Programme Code – 057

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B. Sc. (Mathematics) Curriculum and scheme w.e.f. July, 2022

Program Outcomes:

PO1. Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

PO2. Ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.

PO3. Familiarize the students with suitable tools of mathematical analysis to handle issues and problems in mathematics and related sciences.

PO4. Enhancing students overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.

PO5. Ability to pursue advanced studies and research in pure and applied mathematical science.

Program Specific Outcomes:

PSO1. Think in a critical manner.

PSO2. Formulate and develop mathematical arguments in a logical manner.

PSO3. Introduction to various courses like group theory, ring theory, metric spaces, number theory, solid geometry, vector calculus, differential equations, C programming, numerical analysis etc.

PSO4. Acquire good knowledge and understanding in advanced areas of mathematics, chosen by student from the given courses.

Scheme of Examination of B.Sc. in the subject of Mathematics
Semester 1st (July 2022)

Paper Code	Title of Paper	Allocation of Periods	Maximum Marks			Credits
			External Marks	Internal Marks	Total	
			B.Sc.	B.Sc.	B.Sc.	
MAT101A	Algebra	6 periods/ 4½ hours per week	40	10	150	4½
MAT101B	Calculus	6 periods/ 4½ hours per week	40	10		4½
MAT101C	Solid Geometry	6 periods/ 4½ hours per week	40	10		4½

Semester 2nd

Paper Code	Title of Paper	Allocation of Periods	Maximum Marks			Credits
			External Marks	Internal Marks	Total	
			B.Sc.	B.Sc.	B.Sc.	
MAT102A	Number Theory and Trigonometry	6 periods/ 4½ hours per week	40	10	150	4½
MAT102B	Ordinary Differential Equations	6 periods/ 4½ hours per week	40	10		4½
MAT102C	Vector Calculus	6 periods/ 4½ hours per week	40	10		4½

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Semester 3rd

Paper Code	Title of Paper	Allocation of Periods	Maximum Marks			Credits
			External Marks	Internal Marks	Total	
			B.Sc.	B.Sc.	B.Sc.	
MAT201A	Advanced Calculus	6 periods/ 4½ hours per week	36	9	150	4½
MAT201B	Partial Differential Equations	6 periods/ 4½ hours per week	36	9		4½
MAT201C	Programming in C and Numerical Methods	6 periods/ 4½ hours per week	36	9		4½
MAP 201	Programming in C & Numerical Methods	2 hours per week per group	12	3		1

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Semester 4th

Paper Code	Title of Paper	Allocation of Periods	Maximum Marks			Credits
			External Marks	Internal Marks	Total	
			B.Sc.	B.Sc.	B.Sc.	
MAT202A	Sequences and Series	6 periods/ 4½ hours per week	36	9	150	4½
MAT202B	Special Functions and Integral Transforms	6 periods/ 4½ hours per week	36	9		4½
MAT202C	Numerical Analysis	6 periods/ 4½ hours per week	36	9		4½
MAP 202	Methods of Numerical Analysis with C Language	2 hours per week per group	12	3		1

Semester 5th

Paper Code	Title of Paper	Allocation of Periods	Maximum Marks			Credits
			External Marks	Internal Marks	Total	
			B.Sc.	B.Sc.	B.Sc.	
MAT 301 A	Real Analysis	6 periods/ 4½ hours per week	40	10	150	4½
MAT 301 B	Groups and Rings	6 periods/ 4½ hours per week	40	10		4½
MAT 301 C	Statics	6 periods/ 4½ hours per week	40	10		4½

Semester 6th

Paper Code	Title of Paper	Allocation of Periods	Maximum Marks			Credits
			External Marks	Internal Marks	Total	
			B.Sc.	B.Sc.	B.Sc.	
MAT302A	Real and Complex Analysis	6 periods/ 4½ hours per week	40	10		4½
MAT302B	Linear Algebra	6 periods/ 4½ hours per week	40	10		4½
MAT302C	Dynamics	6 periods/ 4½ hours per week	40	10	150	4½

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Note:-(i) The other conditions will remain the same as per relevant ordinance and rules and regulations of the University.

(ii) Each Practical group will be of 20 students.

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B.Sc. 1st Year (1st Semester)
Algebra (MAT 101A)

Max. Marks: B.Sc. -40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To introduce the concepts of matrix, application of matrices, eigen values, solution of cubic and biquadratic equations and to develop working knowledge of these concepts.

Section – I

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix.

Section – II

Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices.

Section – III

Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations.

Section – IV

Nature of the roots of an equation Descarte's rule of signs. Solutions of cubic equations (Cardon's method). Biquadratic equations and their solutions.

Course Outcomes

CO1-Understand the concepts related to Matrices, eigen values, eigen vectors.
CO2-Analyze applications of matrices to system of linear equations.
CO3-Demonstrate systematic knowledge of solution of cubic and Biquadratic equations.

Books Recommended :

1. H.S. Hall and S.R. Knight : Higher Algebra, H.M. Publications 1994.

2. Shanti Narayan : A Text Books of Matrices.

3. Chandrika Prasad: Text Book on Algebra and Theory of equations, Pothishala Private Ltd., Allahabad.

4. Khurosh: Higher Algebra (Mir Publication).

B.Sc. 1st Year (1st Semester)
Calculus (MAT 101B)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: The course objective is to develop problem solving skills and to acquire knowledge on some of basic concepts in limit, continuity, derivatives, asymptotes, curvature, Quadrature and volume of solids.

Section – I

Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

Section – II

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Newton's method. Radius of curvature for pedal curves. Tangential Polar equations. Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps.

Section – III

Tracing of curves in Cartesian, parametric and polar co-ordinates. Reduction formulae. Rectification, intrinsic equations of curve.

Section – IV

Quardrature (area) Sectorial area. Area bounded by closed curves. Volumes and surfaces of solids of revolution. Theorem of Pappu's and Guilden.

Course Outcomes:

CO1-Understand the concepts of limit, continuity and differentiability of a function.

CO2-Understand the concepts of asymptotes, curvature and point of inflexion.

CO3-To gain knowledge of tracing of curves in Cartesian, parametric and polar co-ordinates.

CO4-Understand the concepts of Quadrature, Volume and surfaces of revolution.

Books Recommended :

1. Shanti Narayan: Differential and Integral Calculus.

2. Murray R. Spiegel: Theory and Problems of Advanced Calculus. Schaum's Outline series, Schaum Publishing Co., New York.

3. N. Piskunov : Differential and integral Calculus. Peace Publishers, Moscow.

4. Gorakh Prasad : Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.

5. Gorakh Prasad : Integral Calculus. Pothishala Pvt. Ltd., Allahabad.

B.Sc. 1st Year (1st Semester)
Solid Geometry (MAT 101C)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To acquire knowledge on conic sections, sphere, cone, central conicoids and plane sections of conicoids.

Section – I

General equation of second degree. Tracing of conics. Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic. System of conics. Confocal conics. Polar equation of a conic, tangent and normal to the conic.

Section – II

Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, Radical plane of two spheres. Co-axal system of spheres.

Section – III

Cones: Right circular cone, enveloping cone and reciprocal cone.
Cylinder: Right circular cylinder and enveloping cylinder.

Section – IV

Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a coincoid. Enveloping cylinder of a coincoid.
Paraboloids: Circular section, Plane sections of conicoids.
Reduction of second degree.

Course Outcomes:

CO1-To gain knowledge about conics and its tracing.

CO2-Understand the concepts of sphere, cone and cylinder.

CO3-To gain knowledge on central conicoids, paraboloids and plane section of conicoids.

Books Recommended:

1. R.J.T. Bill: Elementary Treatise on Coordinary Geometry of three Dimensions, MacMillan India Ltd. 1994
2. P.K. Jain and Khalil Ahmad: A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.
3. Shanti Narayan: Solid Geometry, S. Chand and Company.

B.Sc. 1st Year (2nd Semester)
Number Theory and Trigonometry (MAT 102A)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To introduce the concepts of G.C.D., L.C.M. and related theorems, trigonometrical functions, hyperbolic functions and also skills for applying them in number theory and construction of certain fields.

Section – I

Divisibility, G.C.D. (greatest common divisors), L.C.M.(least common multiple) Primes, Fundamental Theorem of Arithemetic. Linear Congruences, Fermat's theorem. Wilson's theorem and its converse. Linear Diophanatine equations in two variables.

Section – II

Complete residue system and reduced residue system modulo m. Euler's ϕ function Euler's generalization of Fermat's theorem. Chinese Remainder Theorem. Quadratic residues. Legendre symbols. Lemma of Gauss; Gauss reciprocity law. Greatest integer function [x]. The number of divisors and the sum of divisors of a natural number n (The functions d(n) and σ (n)). Moebius function and Moebius inversion formula.

Section - III

De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.

Section – IV

Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series.

Course Outcomes:

CO1- Learn about some important results in the theory of numbers including the prime number theorem, Fermat's theorem, Chinese remainder theorem, Wilson's theorem and their consequences.

CO2-Learn about number theoretic functions, modular arithmetic and their applications.

CO3-Understand the concepts of circular, hyperbolic functions, De Moivre's theorem and its applications.

Books Recommended :

1. S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.
2. R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.
3. Ivan Niven and H.S. Zuckerman. An Introduction to the Theory of Numbers.
4. G.F. Andrew : Number Theory.
5. D.M. Burton: Elementary Number Theory.

B.Sc. 1st Year (2nd Semester)
Ordinary Differential Equations (MAT 102B)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To provide some standard methods for solving first-order, second-order and higher-order homogeneous and nonhomogeneous ordinary differential equations and total differential equations.

Section – I

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x,y,p. Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

Section – II

Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous. Linear ordinary differential equations.

Section – III

Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.

Section – IV

Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. Simultaneous equation of the form $dx/P = dy/Q = dz/R$. Total differential equations. Condition for $Pdx + Qdy + Rdz = 0$ to be exact. General method of solving $Pdx + Qdy + Rdz = 0$ by taking one variable constant. Method of auxiliary equations.

Course Outcomes:

CO1- Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.

CO2-Learn various techniques of reduction to normal form and solutions of ordinary simultaneous differential equations.

Books Recommended :

1. D.A. Murray: Introductory Course in Differential Equations. Orient Longaman (India), 1967.
2. A. R. Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington: Introduction to Differential Equations.
4. S.L.Ross: Differential Equations, John Wiley & Sons.
5. B.Rai & D.P. Chaudhary: Ordinary Differential Equations; Narosa Publishing House Pvt. Ltd.

B.Sc. 1st Year (2nd Semester)
Vector Calculus (MAT 102C)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To acquire knowledge on product of vectors, gradient, divergence, curl, curvilinear co-ordinates, differentiation and integration of vector functions.

Section – I

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.

Section – II

Gradient of a scalar point function, geometrical interpretation of grad Φ, character of gradient as a point function. Divergence and curl of vector point function, characters of Div. $\vec{f}$ and Curl $\vec{f}$ as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.

Section – III

Orthogonal curvilinear coordinates Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors. Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates, Cylindrical co-ordinates and Spherical co-ordinates.

Section – IV

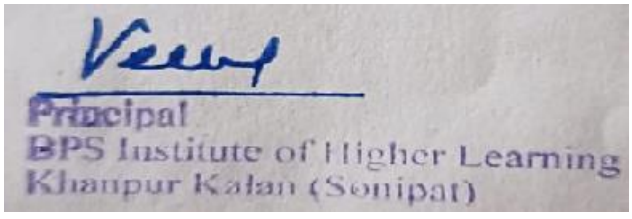
Vector integration; Line integral, Surface integral, Volume integral. Theorems of Gauss, Green & Stokes and problems based on these theorems.

Course Outcomes:

CO1-To acquire knowledge on scalar and vector product of multiple vectors and differentiation of vector point functions.
CO2-Understand the concepts of gradient, divergence, curl and curvilinear co-ordinates.
CO3- To gain knowledge on vector integration, Green, Gauss and Stoke's theorems.

Books Recommended:

1. Murrary R. Spiegal : Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murrary R. Spiegal : Vector Analysis, Schaum Publisghing Company, New York.
3. N. Saran and S.N. NIgam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
4. Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.



B.Sc. 2nd Year (3rd Semester)
Advanced Calculus (MAT 201A)

Max. Marks: B.Sc.-36
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To develop skills and to acquire knowledge on the concepts of continuity, mean value theorems, Partial differentiation, differentiability, spherical curvature, involutes and evolutes.

Section – I.

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.

Section – II

Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions & implicit functions. Change of variables. Homogenous functions & Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.

Section – III

Differentiability of real valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.

Section – IV

Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. Curvature in two dimensions. Locus of the centre of curvature. Spherical curvature, Locus of centre of Spherical curvature, Involutes, evolutes, Bertrand Curves.

Course Outcomes:

CO1- Understand the consequences of various mean value theorems for differentiable functions.

CO2-To gain knowledge on limit, continuity, differentiability, Euler and Taylor's theorems.

CO3-Understand the concepts of tangents and normal to curves, Serret-Frenet formulae, spherical curvature and Bertrand Curves.

Books Recommended:

1. C.E. Weatherburn: Differential Geometry of three dimensions, Radhe Publishing House, Calcutta.
2. Gabriel Klaumber: Mathematical analysis, Mrcel Dekkar, Inc., New York, 1975.
3. R.R. Goldberg: Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970.
4. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad.
5. S.C. Malik: Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan: A Course in Mathemtical Analysis, S.Chand and company, New Delhi.

B.Sc. 2nd Year (3rd Semester)
Partial Differential Equations (MAT 201B)

Max. Marks: B.Sc.-36
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To develop knowledge on partial differential equations, reduction to normal form, various methods of solving it and solutions of heat, wave and Laplace equations.

Section – I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

Section – II

Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant co-efficients, Partial differential equation with variable co-efficients reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.

Section – III

Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.

Section – IV

Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation, Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Course Outcomes: CO1-Apply a range of techniques to solve first, second and higher order partial differential equations.

CO2-Understand the concepts of classification of partial differential equations and Cauchy's problem.

CO3- To gain knowledge on heat, wave and Laplace equations.

Books Recommended:

1. D.A.Murray: Introductory Course on Differential Equations, Orient Longman, (India), 1967
2. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
4. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
5. J.N. Sharma & Kehar Singh : Partial Differential Equations.

B.Sc. 2nd Year (3rd Semester)
Programming in C and Numerical Methods (MAT 201C)
Part-A (Theory)

Max. Marks: B.Sc.-36
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**. The students are allowed to use **simple calculator**.

Course Objectives: The objective of this course is the comprehensive study of C Programming Language and numerical methods for solving equations and simultaneous linear algebraic equations.

Section – I

Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions.

Section – II

Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures. Functions, Preprocessors and Arrays.

Section – III

Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Pointers Data type, Pointers and Arrays, Pointers and Functions.
Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number, Order of convergence of above methods.

Section – IV

Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition Method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Course Outcomes:

CO1- Understand and apply the programming concepts of C Language which is important for mathematical investigation and problem solving.

CO2-To gain knowledge on numerical methods for solution of algebraic and Transcendental equations.

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CO3- Understand the various numerical methods for finding solution of simultaneous linear equations.

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1999.
4. M.K. Jain, S.R.K.Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
5. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
6. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
7. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.
8. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.
9. Babu Ram: Numerical Methods, Pearson Publication.
10. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.

B.Sc. 2nd Year (3rd Semester)

Part-B(Practical)

Programming in C & Numerical Methods (MAP 201)

Max. Marks

	External	**Internal**
B.Sc.	12	3

Time: 2 Hours

There will be a separate practical paper which will consist of simple programs in C and implementation of Numerical Methods studied in the theory paper MAT 201C (Part-A).

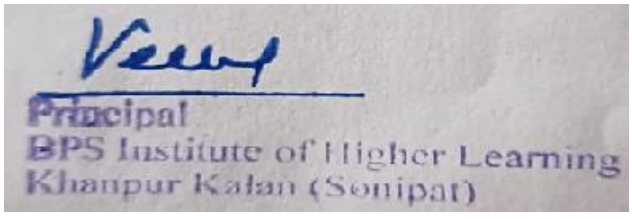
Course Objectives: To study the programs of mathematical problems with the help of C language.

List of Practicals:

1. Program to convert a decimal number to its binary equivalent.
2. Program to generate first n prime numbers.
3. Program to calculate compound interest.
4. Program for pattern matching of two strings.
5. Program to solve a quadratic equation.
6. Program to generate first n Fibonacci terms using recursion.
7. Program to find the GCD of two integers and use it to find the GCD of three integers using functions.
8. Program to find transpose of a Matrix.
9. Program to find roots of an equation by Bisection Method.
10. Program to find roots of an equation by Regula-Falsi Method.
11. Program to find roots of an equation by Newton-Raphson Method.

Course Outcomes:

Understand and apply the programming concepts of C Language which is important for mathematical investigation and problem solving.



B.Sc. 2nd Year (4th Semester)
Sequences and Series (MAT 202A)

Max. Marks: B.Sc.-36
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To develop skills and to acquire knowledge on some basic concepts of open set, closed set, convergence and divergence of sequences and series and alternating series.

Section – I

Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weierstrass theorem, Open covers, Compact sets and Heine-Borel Theorem.

Section – II

Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Subsequential limits. Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series.

Section – III

Infinite series: D-Alembert's ratio test, Raabe's test, Logarithmic test, de Morgan and Bertrand's test, Cauchy's Nth root test, Gauss Test, Cauchy's integral test, Cauchy's condensation test.

Section – IV

Alternating series, Leibnitz's test, absolute and conditional convergence, Arbitrary series: abel's lemma, Abel's test, Dirichlet's test, Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet's theorem, Riemann's Re-arrangement theorem. Pringsheim's theorem (statement only), Multiplication of series, Cauchy product of series (definitions and examples only). Convergence and absolute convergence of infinite products (definitions and examples only).

Course Outcomes: CO1- Understand several standard concepts of set of real numbers and its properties like openness, closedness, compactness, Bolzano-Weierstrass theorem and Heine Borel theorem.

CO2-To gain knowledge on various techniques of convergence and divergence of real sequences and Series.

CO3-To gain knowledge on alternating series, infinite products and various tests to check their convergence.

Books Recommended:

1. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
2. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
3. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
4. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
5. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. Earl D. Rainville, Infinite Series, The Macmillan Co., New York

B.Sc. 2nd Year (4th Semester)

Special Functions and Integral Transforms (MAT 202B)

Max. Marks: B.Sc.-36

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To develop skills and acquire knowledge on series solution of differential equations, Laplace transforms, Fourier transforms and their applications.

Section – I

Series solution of differential equations – Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.

Section – II

Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orhogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

Section – III

Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, solution of ordinary differential equations using Laplace transform.

Section – IV

Fourier transforms: Linearity property, Shifting, Modulation, Convolution Theorem, Fourier Transform of Derivatives, Relations between Fourier transform and Laplace transform, Parseval's identity for Fourier transforms, solution of differential Equations using Fourier Transforms.

Course Outcomes:

CO1-To gain knowledge on power series solution of differential equations, Bessel, Legendre and Hermite's differential eqution.

CO2-Understand the concepts of Laplace Transforms and its application to solve ordinary differential equations.

CO3-Understand the concepts of Fourier Transforms and its application to solve ordinary differential equations.

Books Recommended:

1. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
2. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
3. I.N. Sneddon : Special Functions on mathematics, Physics & Chemistry.
4. W.W. Bell : Special Functions for Scientists & Engineers.
5. I.N. Sneddon: the use of integral transform, McGraw Hill, 1972.
6. Murray R. Spiegel: Laplace transform, Schaum's Series.

B.Sc. 2nd Year (4th Semester)
Numerical Analysis (MAT 202C)
Part-A (Theory)

Max. Marks: B.Sc.-36
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**. The students are allowed to use **simple calculator**.

Course Objectives: To gain knowledge of interpolation methods, probability distributions, numerical differential and integration and learn about Programming of various Numerical Methods.

Section-I

Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite's Formula.

Section-II

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula.
Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution: Mean, Variance and Fitting.

Section-III

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections–I & II.
Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method, QR method, Lanczos method.

Section-IV

Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one-third and three-eight rule, Chebychev formula, Gauss Quadrature formula.
Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta methods. Multiple step methods, Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Course Outcomes:
CO1-Learn about various interpolating methods.
CO2- Learn to solve initial value problems in differential equations using numerical methods.

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CO3- Understand the concepts of probability distribution, numerical differentiation and numerical integration.

CO4-Learn about Programming of various Numerical Methods.

Books Recommended:

1. Babu Ram: Numerical Methods, Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M.K. Jain, S.R.K.Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C.E. Froberg : Introduction to Numerical Analysis (2^{nd} Edition).
6. Melvin J. Maaron: Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York.
7. R.Y. Rubnistein: Simulation and the Monte Carlo Methods, John Wiley, 1981.

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B.Sc. 2nd Year (4th Semester)

Part-B(Practical)

Methods of Numerical Analysis with C Language (MAP 202)

Max. Marks

	External	**Internal**
B.Sc.	12	3

Time: 2 Hours

There will be a separate practical paper which will consist of implementation of numerical methods, studied in the theory paper MAT 202C (Part-A), in 'C' Programming Language.

Course Objectives: To learn about programming of numerical methods with the help of C language.

List of Practicals:

1. Program for interpolation by Newton-Forward method.
2. Program for interpolation by Newton-Backward method.
3. Program for interpolation by Lagrange's method.
4. Program for Numerical integration by Trapezoidal Rule.
5. Program for Numerical integration by Simpson's 1/3 Rule.
6. Program for Numerical integration by Simpson's 3/8 Rule.
7. Program to execute Euler's method.
8. Program to execute Euler's modified method.
9. Program to execute Runge-Kutta method of fourth order.
10. Program to execute Milne Simpson method.

Course Outcomes: To Learn about Programming of various Numerical Methods.

B.Sc. 3rd Year (5th Semester)
Real Analysis (MAT 301A)

Max. Marks: B.A.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To analyze the concepts of Riemann integral, improper integral, metric spaces, continuity, open sets, closed sets and connectedness.

Section – I

Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus.

Section – II

Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter. Continuity, Differentiability and integrability of an integral of a function of a parameter.

Section – III

Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle.

Section – IV

Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness , components, continuity in relation with connectedness.

Course Outcomes:

CO1- Understand the concepts of Riemann integral and mean value theorems of integral calculus.

CO2-Understand the concepts of improper integrals and their convergence.

CO3- Understand several standard concepts of metric spaces and their properties like openness, closedness, completeness, Bolzano-Weierstrass property, compactness, and connectedness.

Book s Recommended:

1. P.K. Jain and Khalil Ahmad: Metric Spaces, 2nd Ed., Narosa, 2004
2. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
4. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
5. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
6. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
7. G.F. Simmons : Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

B.Sc. 3rd Year (5th Semester)
Groups and Rings (MAT 301B)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objective: To introduce the concepts Groups, permutation groups, Rings, Euclidean rings, Polynomial rings, field, homomorphism and some related theories and to develop working knowledge of these concepts.

Section – I

Definition of a group with example and simple properties of groups, Subgroups and Subgroup criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, Index of a sub-group Coset decomposition, Lagrange's theorem and its consequences, Normal subgroups, Quotient groups.

Section – II

Homomorphisms, isomophisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, Permutations groups. Even and odd permutations. Alternating groups, Cayley's theorem, Center of a group and derived group of a group.

Section – III

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (principle, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

Section – IV

Euclidean rings. Principal ideal domains. Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion of irreducibility.

Course Outcomes:

CO1-Explain the concepts of group and its properties, homomorphism, permutation groups, Lagrange's theorem and Cayley's theorem.

CO2-Understand the concepts of rings, ideals, Euclidean rings, principal ideal domains, field and Eisenstein's criterion of irreducibility.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal: Basic Abstract Algebra (2nd edition).
3. Vivek Sahai and Vikas Bist : Algebra, NKarosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Norsa Publishing House.
5. J.B. Gallian: Abstract Algebra, Narosa Publishing House.

B.Sc. 3rd Year (5th Semester)
Statics (MAT 301C)

Max. Marks-B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To develop skills and to acquire knowledge on forces, moments, couples, friction, virtual work, wrenches and condition of equilibrium.

Section – I

Composition and resolution of forces. Parallel forces. Moments and Couples.

Section – II

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.

Section – III

Virtual work. Forces in three dimensions. Poinsots central axis.

Section – IV

Wrenches. Null lines and planes. Stable and unstable equilibrium.

Course Outcomes:
CO1-To gain knowledge about composition and resolution of forces, moments and couples.
CO2-Understand the analytical conditions of equilibrium of coplanar forces, friction, centre of gravity and central axis.
CO3-To gain knowledge on Wrenches, null lines, stable and unstable equilibrium.

Books Recommended:

1. S.L. Loney: Statics, Macmillan Company, London.
2. R.S. Verma: A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.

B.Sc. 3rd Year (6th Semester)
Real and Complex Analysis (MAT 302A)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To study the concepts of Beta and Gamma functions, Double and triple integration, Fourier's series, complex plane, analytic functions, elementary functions and Mobius transformation.

Section – I

Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals.

Section – II

Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co-efficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals.

Section – III

Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.

Section – IV

Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings, Mobius transformations. Fixed points, Cross Ratio, Inverse Points.

Course Outcomes:

CO1- Learn about Beta and Gamma functions, double and triple integral.

CO2-Learn about Fourier series and Parseval's identity.

CO3-Understand the concepts of complex plane, analytic functions, Conformal mappings and Mobius transformations.

Books Recommended:

1. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970.
3. D. Somasundaram and B. Choudhary : A First Course in Mathematical, Analysis, Narosa Publishing House, New Delhi, 1997.
4. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi.
5. R.V. Churchill & J.W. Brown: Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
6. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

B.Sc. 3rd Year (6th Semester)
Linear Algebra (MAT 302B)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: The main objective of this course is to gain knowledge on vector spaces, Homomorphism, linear transformation, Dual space, Null space, Range space, inner product space and theories related to these concepts.

Section – I

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vactor space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

Section – II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensional vector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem.

Section – III

Algebra of Linear Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

Section – IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt Orthogonalization process, Adjoint of a linear transformation and its properties, Unitary linear transformations.

Course Outcomes:

CO1-Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
CO2-Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations.
CO3-Learn properties of inner product spaces and determine orthogonality in inner product spaces.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal: Basic Abstract Algebra (2nd edition).
3. Vivek Sahai and Vikas Bist : Linear Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Narosa Publishing House.
5. Gilbert: Linear Algebra.

B.Sc. 3rd Year (6th Semester)
Dynamics (MAT 302C)

Max. Marks: B.Sc.-40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 8.5 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **four** short answer type questions (carrying total 6 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Course Objectives: To learn about velocity, acceleration, relative velocity, simple harmonic motion, Newton's laws of motion, projectile, central orbit and Kepler laws of motion.

Section – I

Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.

Section – II

Mass, Momentum and Force. Newton's laws of motion. Work, Power and Energy. Definitions of Conservative forces and Impulsive forces.

Section – III

Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.

Section – IV

General motion of a rigid body. Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions. Acceleration in terms of different co-ordinate systems.

Course Outcomes:
CO1-To acquire knowledge on motion of a particle along smooth and rough plane curve, S.H.M., elastic strings.
CO2-Understand the concepts Newton's Law of motion, Work, Power and Energy.
CO3- To gain knowledge on Central orbits, Kepler laws of motion.

Books Recommended:

1. S.L.Loney : An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
2. F. Chorlton : Dynamics, CBS Publishers, New Delhi
3. A.S. Ramsey: Dynamics Part-1&2, CBS Publisher & Distributors.

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Institute of higher learning

(Department of Chemistry)

Curriculum and Scheme of Examination of Three Year B.Sc. (Non Medical)

(w.e.f. July 2022)

Program code – 055

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Scheme of Examination
in the subject of Chemistry
(B.P.S.M. Vishwavidhalya, Khanpur Kalan) w.e.f July 2022
Year I
Semester I:

Sr. No.	Paper Code	Name of Paper	Marks		Periods (in hours)	Credits	ExamTime (in hours)
			Internal Marks	External Marks			
1	CHE 101 A	Inorganic Chemistry	6	27	2	2	3
2	CHE 101 B	Physical Chemistry	7	27	2	2	3
3	CHE 101 C	Organic Chemistry	7	26	2	2	3
4	CHP 101	Chemistry Practical	10	40	4	2	4

Total Marks-=150

Semester 2:

Sr. No.	Paper Code	Name of Paper	Marks		Periods (in hours)	Credits	ExamTime (in hours)
			Internal Marks	External Marks			
1	CHE 102 A	Inorganic Chemistry	6	27	2	2	3
2	CHE 102 B	Physical Chemistry	7	27	2	2	3
3	CHE 102 C	Organic Chemistry	7	26	2	2	3
4	CHP 102	Chemistry Practical	10	40	4	2	4

Total Marks-=150

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Year II

Semester 3:

Sr. No.	Paper Code	Name of Paper	Marks		Periods (in hours)	Credits	ExamTime (in hours)
			Internal Marks	External Marks			
1	CHE 201 A	Inorganic Chemistry	6	27	2	2	3
2	CHE 201 B	Physical Chemistry	7	27	2	2	3
3	CHE 201 C	Organic Chemistry	7	26	2	2	3
4	CHP 201	Chemistry Practical	10	40	4	2	4

Total Marks-=150

Semester 4:

Sr. No.	Paper Code	Name of Paper	Marks		Periods (in hours)	Credits	ExamTime (in hours)
			Internal Marks	External Marks			
1	CHE 202 A	Inorganic Chemistry	6	27	2	2	3
2	CHE 202 B	Physical Chemistry	7	27	2	2	3
3	CHE 202 C	Organic Chemistry	7	26	2	2	3
4	CHP 202	Chemistry Practical	10	40	4	2	4

Total Marks-=150

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Year III

Semester 5:

Sr.No.	Paper Code	Name of Paper	Marks		Periods (in hours)	Credits	ExamTime (in hours)
			Internal Marks	External Marks			
1	CHE 301 A	Inorganic Chemistry	6	27	2	2	3
2	CHE 301B	Physical Chemistry	7	27	2	2	3
3	CHE 301 C	Organic Chemistry	7	26	2	2	3
4	CHP 301	Chemistry Practical	10	40	4	2	4

Total Marks-=150

Semester 6:

Sr. No.	Paper Code	Name of Paper	Marks		Periods (in hours)	Credits	ExamTime (in hours)
			Internal Marks	External Marks			
1	CHE 302 A	Inorganic Chemistry	6	27	2	2	3
2	CHE 302 B	Physical Chemistry	7	27	2	2	3
3	CHE 302C	Organic Chemistry	7	26	2	2	3
4	CHP 302	Chemistry Practical	10	40	4	2	4

Total Marks-=150

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Programme Outcomes (PO) for Under Graduate Programmes of B.Sc. (Medical)

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems
PO4	Individual and Team Work	Capable to learn and work effectively as an individual , and as a member or leader in diverse teams, multidisciplinary settings
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

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PROGRAMME SPECIFIC OUTCOMES OF B.Sc. (Medical)

PSO1 Acquire good knowledge about the fundamentals and applications of chemical and scientific theories.

PSO2 All branches of Science and Technology are related to Chemistry.

PSO3 Easily assess the properties of all elements discovered.

PSO4 Will become familiar with the different branches of chemistry like analytical, physical, organic, inorganic, environmental and polymer.

PSO5 Will help in understanding the causes of environmental pollution and can open up new methods to control environmental pollution.

PSO6 Will develop analytical skills and problem-solving skills requiring application of chemical principles.

PSO7 Have the ability to synthesize, separate and characterize compounds using laboratory and instrumentation techniques.

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B. Sc. Ist Year (Ist Semester)

Paper - Inorganic Chemistry **Max. Marks: 27**
CHE-101 A **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be to attempt five questions in all .Question number one wiil be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Atomic structure
- Periodic properties
- Bonding in molecules

Section-A

Atomic Structure

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals.

Section-B

Periodic Properties

General principles of periodic table .Aufbau and Pauli exclusion principles, multiplicity rule .Electronic configurations of the elements, effective nuclear charge, Slater's rules. Atomic and ionic radii , ionization energy, electron affinity and electronegativity definition , methods of determination or evaluation, trends in periodic table (in s, p block elements).

Section-C

Covalent Bond

Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7 SO_4^{2-}, ClO_4^-) Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICI_2^- and H_2O. MO theory of heteronuclear (CO and NO) diatomic molecules,bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Section-D

Ionic Solids

Ionic structures (NaCl,CsCl,ZnS(Zinc Blende), CaF_2) radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (methamtical derivation excluded) and Born-Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajans rule.

Course outcome: The students will be able to

- know the idea of de-Broglie equation and Heisenberg's uncertainty principal
- Understand the quantum numbers and principal of extra stability.
- Understand the periodic properties of elements in periodic table.
- Explain the VBT and MOT of different molecule.
- Discuss the alkali and alkaline earth metal with their properties.

Reference Books:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. &Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.

- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry:Principles of Structure and Reactivity*, Pearson Education India, 2006.
- Pradeep's inorganic chemistry, Volume I.
- R Chand, inorganic chemistry, Volume I.
- Modern publications,inorganic chemistry, Volume I.

B. Sc. Ist Year (Ist Semseter)

Paper - Physical Chemistry

CHE-101 B **Marks: 27**

Time: 3 hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all.Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Gaseous , liquid and solid states
- Critical phenomenon
- Liquid crystals

Section – A

Gaseous States

Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path. Deviation of Real gases from ideal behaviour. Derivation of Vander Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Explanation of behaviour of real gases using Vander Waal's equation.

Secton-B

Critical Phenomenon:

Critical temperature, Critical pressure ,critical volume and their determination .PV isotherms of real gases, continuity of states, the isotherms of Vander Waal's equation, relationship between critical constants and Vander Waal's constants. Critical compressibility factor. The Law of corresponding states.

Lequifaction of gases.

Section-C

Liquid States

Structure of liquids. Properties of liquids – surface tension

,viscosity vapour pressure and optical rotations and their

determination.

Section-D

Solid State

Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements of crystals. Definition of unit cell & space lattice. Bravais lattices, crystal system. X-ray diffraction by crystals. Derivation of Bragg equation.Determination of crystal structure of NaCl, KCl. Liquid crystals: Difference between solids, liquids and liquid crystals,types of Liquid crystals. Applications of liquid crystal

Course outcome: The students will be able to

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- Know about Maxwell's distribution of various velocities, behavior of real and ideal gas and deviation of real gases from ideal behavior, Vander waal equation and it's applications.
- Understand about critical constant, it's derivation and of liquefaction of gases.
- know about structure of liquids with their properties like surface tension, viscosity,vapoue pressure and optical rotation know about solids, there types ,symmetry elements of crystals, unit cell and space lattice.
- Determine the internal structure of crystal by Bragg's equation and liquid crystals.

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- B. R. Puri, Madan S. Pathania , L. R. Sharma *Principles of Physical Chemistry, 48th Ed.*, Vishal Publications.
- Peter Atkins , Julio de Paula , James Keeler *Atkins' Physical Chemistry*, Oxford University Press.

B. Sc. Ist Year (Ist Semester)

Paper -Organic Chemistry **Max. Marks: 26**
CHE -101C **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Bonding in organic compounds
- Stereochemistry of organic compounds
- Mechanism of organic reactions
- Saturated hydrocarbons

Section-A

1. Structure and Bonding

Localized and delocalized chemical bond, van der Waals interactions, resonance: conditions, resonance effect and its applications, hyperconjgation, inductive effect, Electromeric effect & their comparison.

2. Stereochemistry of Organic Compounds–I

Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso-compounds, resolution of enantiomers, inversion, retention and racemization.

Section-B

Stereochemistry of Organic Compound

Relative and absolute configuration, sequence rules, R & S systems of nomenclature. Geometric isomerism, determination of configuration of geometric isomers. E & Z system of nomenclature ,Conformational isomerism, conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds,. Newman projection and Sawhorse formulae, Difference between configuration and conformation.

Section-C

Mechanism of Organic Reactions

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking.Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates carbocations, carbanions, free radicals, carbenes ,arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.

Section-D

Alkanes and Cycloalkanes

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties .Cycloalkanes : nomenclature, synthesis of cycloalkanes and their derivatives –photochemical (2+2) cycloaddition reactions, , dehalogenation of α,ω-dihalides, , pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations., theory of strainless rings.

Course outcome: The students will be able to

- Understand delocalisation,vander waal forces, resonance, hyperconjugation, inductive and

1 To understand delocalisation,vander waal forces, resonance, hyperconjugation, inductive and electromeric effect.To knows the basic concept of isomerism and concept of chirality.Distereomerism,meso compounds,racemisation,resolution.

electromeric effect.
- Knows the basic concept of isomerism and concept of chirality.Distereomerism,meso compounds,racemisation,resolution.

- Understand R & S system, E &Z system,geometrical and conformational isomerism with conformational analysisTo understand types of reagents, types of reactions,reactive intermediates.
- Understand the preparation and properties of alkanes and cycloalkanes with Baeyer's Strain theory.

Reference Books:

- Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill education, 2000.
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. &Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.
- Pradeep's organic chemistry, Volume I, II
- R Chand, organic chemistry, Volume I,II
- Modern publications, organic chemistry, Volume -I
- New Age International (P) Ltd, Publishers, Volume I,II.

B.Sc. I Year(1st sem)

Practical (CHP- 101)

Max. Marks: 50 [10(int.)+40(ext.)]

Time: 4 Hrs.

Course objectives: The aim of the course is intended to make the students capable to perform

- volumetric titrations
- kinetic study of first order reactions
- preparation of sol

Section-A (Inorganic)

Volumetric Analysis

1. Redox titrations: Determination of Fe^{2+}, $C_2O_4^{2-}$(using $KMnO_4$, $K_2Cr_2O_7$)

2. Complexometric titrations: Determination of Mg^{2+}, Zn^{2+} by EDTA.

Section-B (Physical)

1. To determine the specific reaction rate of the hydrolysis of methyl

Acetate /ethyl acetate catalyzed by hydrogen ions at room temperature.

2. To prepare arsenioussulphide sol and compare the precipitating power of

mono-, bi – and trivalent anions.

SECTION – C (Organic)

1. Preparation and purification through crystallization or

distillation and ascertaining their purity through melting point

or boiling point

(i) Iodoform from ethanol (or acetone)

(ii) m-Dinitrobenzne from nitrobenzene (use 1:2 conc. HNO_3 -

H_2SO_4mixture if fuming $HNO_3$is not available)

2. To study the process of sublimation of camphor .

Course outcome: The students will be able to

- understand the weighing of substances, preparation of standard solutions and to run redox and complexometric titrations.
- study the kinetics of first order chemical reaction, preparation of colloidal sol and study of its precipitation power.
- know about the preparation and purification of iodoform and meta dinitrobenzene.

Books suggested:-

1. A. D. Chawla , New College Practical Chemistry ,B.Sc. -1 , Vijay Pub. 2011.

2. V. Alexeyev ,Quantative Analysis , Mir Pub. Moscow.

3. S.C. Kheterpal ,S.N. Dhawan ,P.N. Kapil : Advanced Practical Chemistry , Vol -1 ,2011.

4. R.L. Madan ,Practical Chemistry ,B.Sc. Part-1.

B. Sc. Ist Year (IInd Semester)

Paper -Inorganic Chemistry **Max. Marks: 27**
CHE-102 A **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Different types of bonding in compounds
- Semiconductors
- Elements of periodic table(s and p block)

Section-A

Hydrogen Bonding & Vander Waals Forces

Hydrogen Bonding – Definition, Types, effects of hydrogen bonding on properties of substances, application

Brief discussion of various types of Vander Waals Forces

Metallic Bond and Semiconductors

Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond

Semiconductors- Introduction, types and applications.

Section-B

s-Block Elements

Comparative study of the elements including, diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in biosystems.

Chemistry of Noble Gases

Chemical properties of the noble gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon.

SECTION – C

p-Block Elements

Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation).

Boron family (13th gp):-

Diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding), Borazene – chemical properties and structure Trihalides of Boron – Trends in lewis acid character structure of aluminium (III) chloride.

Carbon Family (14th group) _

Catenation, $p\pi$– $d\pi$ bonding (an idea), carbides, fluorocarbons, silicates (structural aspects), silicons – general methods of preparations, properties and uses.

Section-D

Nitrogen Family (15th group)

Oxides – structures of oxides of N, P oxoacids – structure and relative acid strengths of oxoacids of Nitrogen and phosphorus. Structure of white, yellow and red phosphorus.

Oxygen Family (16th group)

Oxyacids of sulphur – structures and acidic strength H_2O_2 – structure, properties and uses.

Halogen Family (17th group)

Basic properties of halogen, interhalogens types properties, hydro and oxyacids of chlorine – structure and comparison of acid strength.

Course outcome: The students will be able to

- Knows the idea of hydrogen bonding, its types and applications.
- understand the concept of vander waal forces.
- understand the metallic bond, band theory theory and semiconductors.
- explain the properties of s -block elements and noble gases.
- discuss the properties of p- block elements.

Reference readings

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. &Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry:Principles of Structure and Reactivity, Pearson Education India, 2006.

- Pradeep’s inorganic chemistry, Volume I.
- R Chand, inorganic chemistry, Volume I.
- Modern publications,inorganic chemistry, Volume II.

B. Sc. Ist Year (IInd Semester)

Paper- Physical Chemistry

CHE-102B

Marks: 27
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Kinetics of the reactions
- Concepts of electrochemistry

Section – A

Kinetics-I

Rate of reaction, rate equation, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction. Half life period of a reaction. Methods of determination of order of reaction,

Section – B

Kinetics-II

Effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for

unimolecular and bimolecular collision. Transition state theory of Bimolecular reactions.

Section-C

Electrochemistry-I

Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance,equivalent conductance and relation among them, their vartion with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law. Debye-Huckel – Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included),

Section-D

Electrochemistry-II

Kohlarausch's Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Application of Kohlarausch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity measurements: determination of degree of dissociation, determination of K_a of acids determination of solubility product of sparingly soluble salts, conductometric titrations. Definition of pH and pK_a, Buffer solution, Buffer action, Henderson – Hazel equation, Buffer mechanism of buffer action.

Course outcome: The students will be able to

- Know about reaction rate, factors affecting rate of reaction, rate constant and half life period for zero, first, second and third order reactions. Method for the determination of order of reactions.
- Understand about Arrhenius equation, theories of reaction rate and transition state theory of bimolecular reaction
- Know about electrolytic conduction, factors affecting it, specific conductance, molar conductance, equivalent conductance, Debye-Huckel-Onsagar's equation.
- Determine the transport numbers by using Hittorf's method.
- Kohlarausch's Law and buffer solutions.

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Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- B. R. Puri, Madan S. Pathania , L. R. Sharma*Principles of Physical Chemistry* Vishal Publications.
- Peter Atkins , Julio de Paula , James Keeler *Atkins' Physical Chemistry*, Oxford University Press.
- K.J. Laidler, *Chemical Kinetics*, Perason.

B. Sc. Ist Year (IInd Semester)

Paper -Organic Chemistry **Max. Marks: 26**
CHE-102 C **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Unsaturated aliphatic hydrocarbons
- Aromatic hydrocarbons
- Haloalkanes and haloarenes.

Section-A

Alkenes

Nomenclature of alkenes, , mechanisms of dehydration of alcoholsand dehydrohalogenation of alkyl halides,. The Saytzeff rule Hofmann elimination, physical properties and relative stabilitiesof alkenes Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration oxidation, oxymercuration -reduction, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$,

Section-B

.Arenes and Aromaticity

Nomenclature of benzene derivatives:. Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up

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to 10 carbon atoms, aromatic, anti - aromatic and non – aromatic

Aromatic electrophilic substitution , general pattern of the mechanism, mechansim of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams. Activating , deactivating substituents and orientation.

Section-C

Dienes and Alkynes

Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of butadiene,. Chemical reactions , 1,2 and 1,4 additions (Electrophilic & free radical mechanism), Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes,

Section-D

Alkyl and Aryl Halides

Nomenclature and classes of alkyl halides, methods of formation ,chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, S_N2 and S_N1 reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

Course outcome: The students will be able to

- understand the preparations and properties of alkenes.
- Know about aromaticity, Huckel's rule and types and mechanism electrophilic substitution reactions of arenes.

- understand the preparations and properties of dienes and alkynes.
- understand the preparations and properties of alkyl and aryl halide including S_N1, S_N2, addition-elemination and elimination-addition reaction mechanism.

Reference Books:

- Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. *Organic Chemistry,* John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. &Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).
- Pradeep's organic chemistry, Volume I & II.
- R Chand, organic chemistry, Volume I & II.
- Modern publications, organic chemistry, Volume- II.
- New Age International (P) Ltd, Publishers, Volume I, II.

B.Sc. I (2^{nd}sem)

Practical CHP-102

Max. Marks: 50 [10(int.)+40(ext.)]

Time: 4 Hrs.

Course objectives: The aim of the course is intended to provide the knowledge of

- Iodometric titration
- Applications of chromatography
- To study physical properties of liquids
- Synthesis of organic compounds.

Section-A (Inorganic)

Volumetric Analysis

1. Iodometic titrations: Determination of Cu^{2+} (using standard hypo Solution).

2. Paper Chromatography

3. Qualitative Analysis of the any one of the following Inorganic cations and anions by paper chromatography (Pb^{2+} Cu^{2+}, Ca^{2+} Ni^{2+}, Cl^- Br^-, I^- and PO_4^{3-} and NO_3^-).

Section-B (Physical)

1. To determine the surface tension of a given liquid by drop number method.

2. To determine the viscosity of a given liquid**.**

3. To determine the specific refractivity of a given liquid

SECTION – C (Organic)

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1. Preparation and purification through crystallization or

distillation and ascertaining their purity through melting point

or boiling point.

i) p - Bromoacetanilide from acetanilide

ii) Dibenzalaceton from acetone and benzaldehyde

iii) Aspirin from salicylic acid.

iv) To study the process of sublimation of phthalic

acid.

Course outcome: The students will be able to

- Understand iodometric titration and paper chromatography.
- Determine the surface tension ,viscosity and refractive index
- Study the preparation and purification of p-Bromoacetanilide, Dibenzalacetone and asprin.

Books Suggested:-

1. A. D. Chawla , New College Practical Chemistry ,B.Sc. -1 , Vijay Pub. 2011.

2. V. Alexeyev ,Quantative Analysis ,Mir Pub. Moscow.

3. S.C. Kheterpal,S.N. Dhawan ,P.N. Kapil : Advanced Practical Chemustry, Vol -1

4.R.L. Madan ,Practical Chemistry ,B.Sc. Part-I

B.Sc. II Year (IIIrd Semester)

Paper - Inorganic Chemistry **Max. Marks: 27**

CHE-201A **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Transition elements
- Coordination compounds
- Non aqueous solvents.

Section-A

Chemistry of Elements of Ist transition series:

Definition of transition elements, position in the periodic table, General characteristics & properites of Ist transition elements,. Structures & properties of some compounds of transition elements – TiO_2, $VOCl_2$, $FeCl_3$, $CuCl_2$ and $Ni(CO)_4$

Section-B

Chemistry of Elements of IInd & IIIrd transition series

General characteristics and properties of the IInd and IIIrd transition elements Comparison of properties of 3d elements with

4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry

Section-C

Coordination Compounds

Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes

Section-D

Non-aqueous Solvents

Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Course outcome: The students will be able to

- Understand the chemistry of elements of 3d series transition elements.
- Study the comparision of properties of 4d and 5d series transition elemrnts with 3d series transition elements..
- Study the Werner's theory,VBT,EAN rule,structural and streoisomerism in coordination compounds
- Explain the non aqueous solvents, there types,various reaction of liquid ammonia and sulphur dioxide.

Reference Books :

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.

- Cotton, F.A., Wilkinson, G. &Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry:Principles of Structure and Reactivity, Pearson Education India, 2006.
- Pradeep's inorganic chemistry, Volume II.
- R Chand, inorganic chemistry, Volume II.
- Modern publications, inorganic chemistry, Volume III.

B. Sc. IInd Year (IIIrd Semester)

Paper - Physical Chemistry

CHE-201B

Max.Marks: 27
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Thermodynamics
- Chemical equilibrium
- Distribution law

SECTION – A

Thermodynamics-I

Definition of thermodynamic terms: system surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law – Joule – Thomson coefficient for ideal gass and real gas: and inversion temperature.

SECTION – B

Thermodynamics-II

Calculation of w.q. dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchffs equation.
Bond energies and applications of bond energies.

SECTION – C

Chemical Equilibrium

Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and its applications Clapeyron equation and Clausius – Clapeyron equation its applications.

SECTION – D

Distributioln Law

Nernst distribution law – its thermodynamic derivation ,Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium constant of potassium tri-iodide complex and process of extraction.

Course outcome: The students will be able to

- Know about the various thermodynamic systems,intensive and extensive properties,thermodynamic process,Zeroth law, Joule's law ,Joule-Thomson coefficient and inversion temperature.
- Calculate w,q,ΔU,ΔH under isothermal, adiabetic conditions study Kirchff's equation and its application of bond energy.
- Study the Vant Hoff's reaction, Le Chaelier's principle , Clausius-Clapeyron equation and its applications.
- Study Nernst distribution law,modification of distribution law and applications of distribution law.

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- B. R. Puri, Madan S. Pathania , L. R. Sharma*Principles of Physical Chemistry* Vishal Publications.
- Peter Atkins , Julio de Paula , James Keeler *Atkins' Physical Chemistry*, Oxford University Press.
- S.Glasstone, *An Introduction To Electrochemistry,* Affiliated East- West Press Pvt. Limited, New Delhi.
- S. Glasstone *Thermodynamics For Chemists.*

B. Sc. IInd Year (IIIrd Semester)

Paper - Organic Chemistry **Max. Marks: 26**
CHE-201C **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Alcohols
- Phenols
- Carboxylic acids and derivatives
- UV spectroscopy

Section-A

1. Alcohols

Monohydric alcohols , nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols.Dihydric alcohols — nomenclature, methods of formation,

chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol –pinacolone rearrangement.

2. Epoxides

Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides

Section-B

Phenols

Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.

Section-C

Ultraviolet (UV) absorption spectroscopy

Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones,Woodward- Fieser rules, calculation of λ_{max} of simple conjugated dienes and α,β-unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.

Section-D

.Carboxylic Acids & Acid Derivatives

Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation.

Structure , nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives.

Physical properties, interconversion of acid derivatives by nucleophilic acylsubstitution.

Mechanisms of esterification and hydrolysis (acidic and basic).

Course outcome: The students will be able to

- Understand the methods of preparations and properties of alcohols,glycol,epoxide,pinacol-pinacolone rearrangement, ring opening of epoxides and Grignard's reagents.
- Understand the methods of preparations and properties of phenols.
- Study the principle,presentation and analysis of UV spectra,structure elucidation of simple organic compound using UV spectroscopy.
- Understand the methods of preparations and properties of carboxylic acids and acid derivatives.

Reference Books:

- Brian Smith: Infrared Spectral Interpretations: A Systematic Approach.
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Mahan, B.H. *University Chemistry*, 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry*, 5th Ed., Macmillan Publishing Co.: New York (1985).
- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry* (*Volume 1*), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Pradeep's organic chemistry, Volume II & III.
- R Chand, organic chemistry, Volume II & III.
- Modern publications, organic chemistry, Volume III
- New Age International (P) Ltd, Publishers, Volume II.

B.Sc. II Year(3rdsem)

Practical – CHP 201

Max. Marks: 50 [10(int.)+40(ext.)]

Time: 4 Hrs.

Course objectives: The aim of the course is intended to provide the practical knowledge of

- Gravimetric analysis
- Inorganic preparations
- Enthalpy change and CST
- Analyzing organic compounds

SECTION – I (Inorganic)

1**. Gravimetric Analysis**

Quantitative estimations of, Cu^{2+}as copper thiocyanate and Ni^{2+} asNi – dimethylglyoxime.

2. **Preparations**: Preparation of Cuprous chloride, prussionbluefrom iron fillings, tetraammine cupric sulphate,

Section-B (Physical)

1. To determine the CST of phenol – water system.

2. To determine the solubility of benzoic acid at various temperatures and to

determine the ▲H of the dissolution process

Section-C (Organic)

(detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bi functional organic compounds: Naphthalene, Anthracene , acenaphthene , benzyl chloride, *p*-dichlorobenzene , *m*-dinitrobenzene , *p*nitrotoluene , resorcinol , hydroquinone, α-naphthol, β-naphthol , benzophenone, ethyl methyl ketone, benzaldehyde , vanillin.

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Course outcome: The students will be able to

- study the gravimetric analysis of Cu^{2+} and Ni^{2+} and preparation of Prussian blue,Cu_2Cl_2 and copper teramine .
- determine the CST of phenol-water system and ΔH of dissolution.
- study the systematic identification of various organic compounds.

Reference Books :

1. A. D. Chawla , New College Practical Chemistry ,B.Sc. -II , Vijay Pub. 2011.

2. V. Alexeyev ,Quantative Analysis ,Mir Pub. Moscow.

3. S.C. Kheterpal,S.N. Dhawan ,P.N. Kapil : Advanced Practical Chemustry, Vol -II .

4.R.L. Madan ,Practical Chemistry ,B.Sc. Part-II.

5. ArunChhikara ,S.P. Bhutani : Qualitative Organic Chemistry .

B. Sc. II Year (IVth Semester)

Paper - Inorganic Chemistry **Max. Marks: 27**

CHE-202A **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Lanthanides and actinoids
- Theory of qualitative and quantitative inorganic analysis.

Section-A

Chemistry of f – block elements

Lanthanides

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

Section-B

Chemistry of f – block elements

Actinides

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.

Section-C

Theory of Qualitative and Quantitative Inorganic Analysis-I

Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.

Section-D

Theory of Qualitative and Quantitative Inorganic Analysis-II

Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co-precipitation, Post- precipitation, purification of precipitates.

Course outcome: The students will be able to

- Understand the occurrence, isolation and properties of lanthanoids.
- Understand the occurrence, isolation and properties of actinoids.
- Take idea of qualitative and quantitative analysis of acid and basic radicals including interfering and combinations.
- Explain theory of precipitation, co-precipitation and purifications.

Reference Books:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. &Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- Pradeep's inorganic chemistry, Volume III.
- R Chand, inorganic chemistry, Volume III.

- Modern publications,inorganic chemistry, Volume IV.
- Coordination chemistry by Ajai kumar, Aaryush publications, Delhi.

B. Sc. IInd Year (IVth Semester)

Paper - Physical Chemistry

CHE-202B

Max.Marks: 27
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Thermodynamics
- Electrochemistry

Section-A

Thermodynamics-III

Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem, Thermodynamics scale of temperature. Concept of entropy – entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change ,entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Section-B

Thermodynamics-IV

Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function

(G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

Section-C

Electrochemistry-III

Electrolytic and Galvanic cells – reversible & Irreversible cells, conventional representation of electrochemical cells. EMF of cell and its measurement, Weston standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction (▲G, ▲H & K).

Types of reversible electrodes – metal- metal ion gas electrode, metal –insoluble salt- anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications.

Section-D

Electrochemistry-IV

Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.

Course outcome: The students will be able to

- Know about the second law of thermodynamics,Carnot's cycle,criteria of spontaneity and entropy of mixing of ideal gaese.
- Study the Nernst heat theorem, absolute entropy,Gibbs-Helmholtz equation and variation of G and A with P,V and T.
- Take ideas of electrochemical cells,Nernst equation, cell EMF, reference cells, electrochemical cell and its applications.
- Study the concentration cells,liquid junction,EMF measurement and determination of pH by using various types of electrodes.

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- B. R. Puri, Madan S. Pathania, L. R. Sharma*Principles of Physical Chemistry* Vishal Publications.
- Chandra, A. K. *Introductory Quantum Chemistry* Tata McGraw-Hill (2001).
- House, J. E. *Fundamentals of Quantum Chemistry* 2nd Ed. Elsevier: USA(2004).
- Lowe, J. P. & Peterson, K. *Quantum Chemistry*, Academic Press (2005).
- Banwell, C. N. & McCash, E. M. *Fundamentals of Molecular Spectroscopy* 4th Ed. Tata McGraw-Hill: New Delhi (2006).
- Pradeep's physical chemistry, Volume III.
- R Chand, physical chemistry, Volume III.
- Modern publications, physical chemistry, Volume IV

B. Sc. IInd Year (IVth Semester)

Paper - Organic Chemistry

CHE-202C

Marks: 26
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- IR spectroscopy
- Nitrogen containing compounds
- Carbonyl compounds.

Section-A

Infrared (IR) absorption spectroscopy

Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation of simple organic compounds.

Section-B

Amines

Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabriel-

phthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid

Section-C

1. Diazonium Salts

Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO_2 and CN groups, reduction of diazonium salts to hyrazines, coupling reaction and its synthetic application.

2. Nitro Compounds

Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium.

Section-D

Aldehydes and Ketones

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate., Physical properties. Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular

emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction.Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and$NaBH_4$ reductions.

Course outcome: The students will be able to

- Study the principle, presentation and analysis of IR spectra, structure elucidation of simple organic compound using IR spectroscopy.
- Understand the preparations and properties of amines,diazonium salts and nitro compounds .
- Understand the preparations and properties of aldehydes and ketones.

Reference Books:

- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- C.N. Banwell: Fundamentals of Molecular Spectroscopy.
- Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Berg, J.M., Tymoczko, J.L. &Stryer, L. *Biochemistry*, W.H. Freeman, 2002.
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Bioch*emistry *7th Ed.*, W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. &Stryer, L. *Biochemistry*, W.H. Freeman, 2002.
- Pradeep's organic chemistry, Volume III.
- R Chand, organic chemistry, Volume III.
- Modern publications, organic chemistry, Volume IV.
- New Age International (P) Ltd, Publishers Volume, I and III.

BSc.2nd (4thsem)

Practicals-CHP 202

Max. Marks: 50 [10 (int.) + 40(ext.)]

Time: 4 Hrs.

Course objectives: The aim of the course is intended to provide the practical knowledge of

- Colorimetery
- Inorganic Synthesis
- Calorimetery
- Distribution law
- Identifying the organic compounds

SECTION – I (Inorganic)

1 **.Colorimetry:**

To verify Beer - Lambert law for $KMnO_4$/$K_2Cr_2O_7$and determine the concentration of the given $KMnO_4$ /$K_2Cr_2O_7$ solution.

2. Preparations: Preparation of chrome alum,

Potassium trioxalatochromate (III).

Section-B (Physical)

1. To determine the enthalpy of neutralisation of a weak Acid /weak base vs. strong base /strong acid and determine the enthalpy of ionisation of the weak acid /weak base.

2. To determine the enthalpy of solution of solid calcium chloride

3. To study the distribution of iodine between water and benzene .

Section-C (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following

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simple mono and bifunctional organic compounds: oxalic acid , succinic acid , benzoic acid , salicyclic acid aspirin, phthalic acid, cinnamic acid, benzamide , urea, acetanilide, benzanilide, aniline hydrochloride, p-toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o* , *m, p*-nitroanilines , thiourea.

Course outcome: The students will be able to

- verify Beer-Lambert law for $KMnO_4$ /$K_2Cr_2O_7$.
- study the preparation of chrome alum and potassium trioxalatochromate(III)
- study the systematic identification of various organic compounds

Books Suggested:-

1. A. D. Chawla , New College Practical Chemistry ,B.Sc. II , Vijay Pub. 2011.

2. V. Alexeyev ,Quantative Analysis ,Mir Pub. Moscow.

3. S.C. Kheterpal,S.N. Dhawan ,P.N. Kapil : Advanced Practical Chemistry, Vol -II ,2011.

4.R.L. Madan ,Practical Chemistry ,B.Sc. Part-II.

5. ArunChhikara ,S.P. Bhutani : Qualitative Organic Chemistry .

B. Sc. III Year (Vth Semester)

Paper - Inorganic Chemistry **Max. Marks: 27**

CHE-301A **Time: 3Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Transition metal complexes- bonding, magnetic properties and stability
- Electronic spectra of Transition metal complexes.

SECTION–A

Metal-ligand Bonding in Transition Metal Complexes

Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

SECTION–B

Thermodynamic and Kinetic Aspects of Metal Complexe

A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt(II).

SECTION-C

Magnetic Properties of Transition Metal Complexe

Type of magnetic behavior , methods of determining magnetic susceptibility ,

Spin only formula , LS coupling ,correlation of μ_s and μ_{eff} values , orbital

contribution to magnetic moments , application of magnetic moment data for 3d

metal complexes

SECTION-D

Electron Spectra of Transition Metal Complexes

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy discussion of the electronic spectrum of $[Ti(H_2O)]^{3+}$ complex ion.

Course outcome: The students will be able to

- study VBT, CFT of octahedral, tetrahedral and square planar complexes, limitation of VBT and factors affecting CFT.
- understand the thermodynamic and kinetic aspects of transition metal complexes,trans effect, theories of trans effect, mechanism of substitution of square planar complexes.
- determine the magnetic moment, magnetic susceptibility,LS coupling of transition metal complexes.
- calculate microstates,ground state terms.idea of selection rule, Orgel-energy diagrams

Reference Books:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. &Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.

- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- Pradeep's inorganic chemistry, Volume III.
- R Chand, inorganic chemistry, Volume III.
- Modern publications,inorganic chemistry, Volume V.
- Coordination chemistry by Ajai kumar, Aaryush publications, Delhi.


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B. Sc. IIInd Year (Vth Semester)

Paper -Physical Chemistry

CHE-301B

Max.Marks: 27
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Quantum mechanics
- Rotational, vibration and Raman spectroscopy

Section-A

Quantum Mechanics-I

Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect,wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonial operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance,

Section-B

Physical Properties and Molecular Structure

Optical activity, polarization – (clausius – Mossotti equation).

Orientation of dipoles in an electric field, dipole moment, included dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetics

.

Section-C

Spectroscopy-I

Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born-oppenheimer approximation, Degrees of freedom.

Rotational Spectrum

Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.

Section-D

Spectroscopy-II

Vibrational spectrum

Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effects of anharmonic motion and isotopic effect on the spectra., idea of vibrational frequencies of different functional groups.

Raman Spectrum:
Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.

Course outcome: The students will be able to

- Know about black body radiation,Plank's radiation law,photoelectric effect,heat capacity of solids,Compton effect,quantum mechanics postulates,operator, particle in one dimensional box.
- Study the Clausius-Mossotti equation,dipole moment measurement, magnetic permeability, magnetic susceptibility and its determination.
- Take idea of electromagnetic radiation, principle and basic features of rotational spectroscopy,non rigid rotator and isotopic effect.
- Study the principle and applications of vibrational and raman spectroscopy.

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- B. R. Puri, Madan S. Pathania, L. R. Sharma*Principles of Physical Chemistry* Vishal Publications.
- Chandra, A. K. *Introductory Quantum Chemistry* Tata McGraw-Hill (2001).
- House, J. E. *Fundamentals of Quantum Chemistry* 2nd Ed. Elsevier: USA(2004).
- Lowe, J. P. & Peterson, K. *Quantum Chemistry*, Academic Press (2005).
- Banwell, C. N. & McCash, E. M. *Fundamentals of Molecular Spectroscopy* 4th Ed. Tata McGraw-Hill: New Delhi (2006).
- Pradeep's physical chemistry, Volume III.
- R Chand, physical chemistry, Volume III.

Modern publications, physical chemistry, Volume V.

B. Sc. IIIrd Year (Vth Semester)

Paper - Organic Chemistry

CHE-301C

Max.Marks: 26
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

. **Course objectives:** The aim of the course is intended to provide the knowledge of

- NMR spectroscopy
- Carbohydrates
- Organometallic compounds.

Section-A

NMR Spectroscopy-I

Principle of nuclear magnetic resonance, the PMR spectrum, number of signals, peak areas, equivalent and non equivalent protons positions of signals and chemical shift, shielding and deshielding of protons, proton counting, splitting of signals and coupling constants, magnetic equivalence of protons..

Section-B

NMR Spectroscopy-II

Discussion of PMR spectra of the molecules: ethyl bromide, n–propyl bromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene,

benzaldehyde and acetophenone.. Simple problems on PMR spectroscopy for structure determination of organic compounds.

SECTION – C

Carbohydrates-I

Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.

SECTION – D

1. Carbohydrates-II

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

2. Organometallic Compounds

Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and

chemical reactions.

Course outcome: The students will be able to

- Study the principle, presentation and analysis of NMR spectra, structure elucidation of simple organic compound using NMR spectroscopy.
- Understand the classification, nomenclature, structure, physical and chemical properties of monosaccharides, oligosaccharides and polysaccharides.
- Understand the structure, preparations and properties of organometallic compounds i.e Grignard's reagent, organozinc and organolithium.

Reference Books:

- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- C.N. Banwell: Fundamentals of Molecular Spectroscopy.
- Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Berg, J.M., Tymoczko, J.L. &Stryer, L. *Biochemistry*, W.H. Freeman, 2002.
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Bioch*emistry *7th Ed.*, W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. &Stryer, L. *Biochemistry*, W.H. Freeman, 2002.
- Pradeep's organic chemistry, Volume III.
- R Chand, organic chemistry, Volume III.
- Modern publications, organic chemistry, Volume V.
- New Age International (P) Ltd, Publishers Volume, I and III.

B.Sc. III Year(Vth Semester)

Practical –CHP 301

Max. Marks: 50 [10(int.)+40(ext.)]

Time: 4 Hrs.

Course objectives: The aim of the course is intended to provide the practical knowledge of

- Radical analysis
- Coductometric titrations
- Separation and purifications of organic compounds.
- Organic preparations.

SECTION – I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (excluding interfering radicals $C_2O_4^{2-}$,PO_4^{3-}, BO_3^{3-}):

Basic Radicals : Pb^{2+}, Hg_2^{2+},Hg^{2+}, Ag^{+}, Bi^{3+},Cu^{2+} ,Cd^{2+}, As^{3+},Sb^{3+}, Sn^{2+}, Fe^{3+}, Cr^{3+},Al^{3+}, Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+},NH_4^{+}

Acid Radicals: CO_3^{2-}, S^{2-},SO_3^{2-}, $S_2O_3^{2-}$, NO_2^{-}, CH_3COO^{-}, Cl^{-}, Br^{-}, I^{-}, NO_3^{-} ,SO_4^{2-}

Section-B (Physical)

1. To determine the strength of the given acid solution (mono and dibasic

acid) conductometrically.

2. To determine the solubility and solubility product of a sparingly soluble

electrolyte conductometrically.

Section-C (Organic)

1. Laboratory Techniques (a) Steam distillation (non evaluative) naphthalene from its suspension in water,

Separation of *o*-and *p* -nitrophenols

(b) Column chromatography (non evaluative)

Separation of fluorescein and methylene blue .Separation of leaf pigments from spinach leaves

2. Synthesis of the following organic compounds:

(a) To prepare o- chlorobenzoic acid from anthranilic acid.

Course outcome: The students will be able to

- Determine normality, strength and of mono and dibasic acid and solubility product of sparingly soluble salt, coductometrically .
- Study the preparation of o-Chlorobenzoic acid and to separate a mixture by using steam distillation and column chromatography technique.
- Study the systematic identification of acid and basic radicals of a mixture without interfering radicals and combinations.

Books Suggested:-

1. A. D. Chawla , New College Practical Chemistry ,B.Sc. -III , Vijay Pub. 2011.

2. S.C. Kheterpal, S.N. Dhawan ,P.N. Kapil : Advanced Practical Chemustry, Vol -III , 2011.

3..R.L. Madan ,Practical Chemistry ,B.Sc. Part-III.

4. A.L. Vogal ,A text book of Micro and Semi-micro quantativeanalysis, Orient Longman Pub.

B. Sc. III Year (VI th Semester)

Paper - Inorganic Chemistry **Max. Marks: 27**

CHE-302A **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Organometallic chemistry
- Acids bases concept
- Bioinorganic chemistry
- Inorganic polymers

Section-A

Organometallic Chemistry

Definition, nomenclature and classification of organometallic compounds. Preparation, properties, and bonding of alkyls of Li, Al, Hg, and Sn a brief account of metal- ethylenic complexes, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Section-B

Acids and Bases, HSAB Concept

Arrhenius, Bronsted – Lowry, the Lux – Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases. Symbiosis, electronegativity and hardness and softness

Section—C

Bioinorganic Chemistry

Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and

myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}. Nitrogen fixation.

Section—D

Silicones and Phosphazenes

Silicones and phosphazenes, their preparation, properties,structure and uses.

Course outcome: The students will be able to

- Study nomenclature, classification and properties of organometallic compounds, Homogeneous catalysis, Wilkinson's catalyst, metal carbonyls and stretching frequency of CO in metal carbonyls.
- Understand the Arrhenius,Bronsted,Lux-Flood and solvent system concept of acid and bases, HSAB principle and its applications and limitations.
- Study the essential and trace elements,metalloporphyrins, hemoglobin and myoglobin,nitrogen fixation.
- Understand the structure, preparations and properties of inorganic polymers i.e silicones and phosphazenes.

Reference books

- B. R. Puri, Madan S. Pathania , L. R. Sharma*Principles of Physical Chemistry* Vishal Publications.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- Pradeep's inorganic chemistry, Volume III.
- R Chand, inorganic chemistry, Volume III.
- Modern publications,inorganic chemistry, Volume VI.
- Coordination chemistry by Ajai kumar, Aaryush publications, Delhi.

B. Sc. IIIrd Year (VIth Semester)

Paper - Physical Chemistry

CHE-302B

Max.Marks: 27
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of seven marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Electronic spectroscopy
- Photochemistry
- Phase diagram
- Colligative properties.

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Section-A

Spectroscopy-III

Electronic Spectrum

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle.

Qualitative description of sigma and pie and n molecular orbital (MO) their energy level and respective transitions.

Section-B

Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus -Drapper law, Stark-Einstein law (law of photochemical equivalence) Jablonski diagram depiciting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples)

Section-C

Solutions:

Dilute Solutions and Colligative Properties

Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raolut's law, relative lowering of vapour pressure, molelcular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

Section-D

Phase Equillibrium

Statement and meaning of the terms – phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system –Example – water and Sulpher systems.

Phase equilibria of two component systems solid-liquid equilibria, simple eutectic

Example Pb-Ag system, desilverisation of lead.

Course outcome: The students will be able to

- Know about potential energy curve, Franck-Condon principle, selection rules in electronic spectroscopy, term symbols.
- Study the lambert-Beer's law, laws of photochemistry, quantum yield, Jablonski diagram, fluorescence and phosphorescence.

- Take idea colligative properties, Raoult's laws,ideal and non ideal solutions,abnormal molecular mass and degree of association and dissociation.

- Understand Gibbs phase rule, phase diagrams one and two component system,degree of freedom.

Reference Books:

- K. K. Rohatgi, Mukherjee,*Fundamentals of Photochemistry*, New Age International
- Banwell, C. N. & McCash, E. M. *Fundamentals of Molecular Spectroscopy* 4th Ed. Tata McGraw-Hill: New Delhi (2006).
- Pradeep's physical chemistry, Volume III.
- R Chand, physical chemistry, Volume III.
- Modern publications, physical chemistry, Volume VI.

B. Sc. IIIrd Year (VIth Semester)

Paper -Organic Chemistry

CHE-302C

Max.Marks: 26
Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each section which will be of five marks each.

Course objectives: The aim of the course is intended to provide the knowledge of

- Heterocyclic and organosulphur compounds
- Synthesis of organic compounds via enolates
- Synthetic polymers, amino acids and proteins

SECTION – A

Heterocyclic Compounds-I

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

SECTION – B

1. Heterocyclic Compounds-II

Introduction to condensed five and six- membered heterocycles. Prepration and

reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline

2.Organosulphur Compounds

Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyl and aryl sulphonates.

SECTION – C

1. Organic Synthesis *via* Enolates

Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto - enol tautomerism of ethyl acetoacetate.

2. **Synthetic Polymers**

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes.Natural and synthetic rubbers.

Section – D

Amino Acids, Peptides& Proteins

Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of α-amino acids. Structure

and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid–phase peptide synthesis. Structures of peptides and proteins Primary & Secondary structure.

Course outcome: The students will be able to

- Understand the structure, preparations and properties of heterocyclic compound.
- Study the structure, preparations and properties of organosulphur,enolates.
- Understand the structure, preparations, properties and uses of synthetic polymers
- Understand the structure, preparations and properties of amino acids, proteins.

Reference Books:

- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- C.N. Banwell: Fundamentals of Molecular Spectroscopy.
- Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Berg, J.M., Tymoczko, J.L. &Stryer, L. *Biochemistry*, W.H. Freeman, 2002.
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Bioch*emistry *7th Ed.*, W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. &Stryer, L. *Biochemistry*, W.H. Freeman, 2002.
- Pradeep's organic chemistry, Volume III.
- R Chand, organic chemistry, Volume III.
- Modern publications, organic chemistry, Volume VI.
- New Age International (P) Ltd, Publishers Volume, I and III
- Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

B.Sc. III Year(6^{th}sem)

Practical-CHP 302

Max. Marks: 50[10(int.)+40(ext.)]

Time: 4 Hrs.

Course objectives: The aim of the course is intended to provide the practical knowledge of

- Radical analysis
- Use of pH meter and potentiometer
- Thin layer chromatography
- Organic synthesis

SECTION – I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insolubles):

Basic Radicals : Pb^{2+}, Hg_2^{2+},Hg^{2+}, Ag^{+}, Bi^{3+},Cu^{2+} ,Cd^{2+}, As^{3+},Sb^{3+}, Sn^{2+}, Fe^{3+}, Cr^{3+},Al^{3+}, Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+},NH_4^{+}

Acid Radicals: CO_3^{2-}, S^{2-},SO_3^{2-}, $S_2O_3^{2-}$, NO_2^{-}, CH_3COO^{-}, Cl^{-}, Br^{-}, I^{-}, $C_2O_4^{2-}$, NO_3^{-} ,SO_4^{2-}, PO_4^{3-}, BO_3^{3-}.

Section-B (Physical)

1. To determine the strength of given acid solution (mono and dibasicacid) potentiometrically.

2. To determine the molecular weight of a non-volatile solute by Rast method.

3. To standardize the given acid solution (mono and dibasic acid) Ph metrically.

Section-C (Organic)

1. Thin Layer Chromatography

Determination of R_f values and identification of organic compunds

(a) Separation of green leaf pigments (spinach leaves may be used)

(b) Separation of a mixture of coloured organic compounds using common organic solvents.

2. Synthesis of the following organic compounds:

(a) To prepare p-bromoaniline from p-bromoacetanilide.

(b) To prepare m-nitroaniline from m-dinitrobenzene.

Distribution of marks

Distribution of marks

External - Total

1. Section I 08 marks

2. Section II 08 marks

3. Section III 08 marks

4. Viva-voce 06 marks

Internal -

Copy+Attendence(8+2)= 10Marks

Course outcome: The students will be able to

- Determine normality, strength and of mono and dibasic acid and solubility product of sparingly soluble salt, coductometrically .
- Study the preparation of p-Bromoaniline and m-nitroaniline and to determine the R_f value and identification of organic compounds using TLC technique.
- Study the systematic identification of acid and basic radicals of a mixture with interfering acid radicals and combinations.

Books suggested:-1. A. D. Chawla , New College Practical Chemistry ,B.Sc. -III , Vijay Pub. 2011.

2. S.C. Kheterpal,S.N. Dhawan ,P.N. Kapil : Advanced Practical Chemistry, Vol -III ,2011.

3.R.L. Madan ,Practical Chemistry ,B.Sc. Part-III.

4.A.L. Vogal ,A text book of Micro and Semi-micro quantative analysis,Orient Longman Pub

Principal
BPS Institute of Higher Learning
Khanpur Kalan (Sonipat)

BHAGAT PHOOL SINGH MAHILAVISHWAVIDYALAYA, KHANPUR KALAN(SONEPAT)

(State University established under legislature act xxxi of 2006)

Department Of Physics

Course Curriculum & Scheme of Three year course For Physics

B. Sc. (Non Medical / Computer Science)

(w.e.f. July 2022)

Programme Code :055

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
BPS Institute of Higher Learning
Khanpur Kalan

DEPATMENT OF PHYSICS

PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

PROGRAMME OUTCOMES

PO1	**DISCIPLINARY KNOWLEDGE**	**(i)** comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Physics and its different subfields like Mathematical Physics, Classical and Quantum mechanics, Thermal and Statistical mechanics, Electricity, Magnetism and Electromagnetic theory, Atomic and Molecular Physics, Condensed matter Physics, Nuclear and Particle Physics, Material Science, Analytical dynamics, Astrophysics and Cosmology, Space science and other related fields of study, including broader interdisciplinary subfields like Chemistry, Mathematics, Life sciences, Environmental sciences, Earth Sciences, Medical Physics, Atmospheric Physics, Computer science, Information Technology etc.. **(ii)** Ability to use physics laboratory methods and modern instrumentation for designing and implementing new experiments in physics, interdisciplinary/multidisciplinary research areas and industrial research.
PO2	**SKILLED COMMUNICATOR**	Ability to transmit abstract concepts and complex information relating to all areas in Physics in a clear and concise manner through scientific report writing. Ability to express complex relationships and information through graphical methods and proper tabulation. Ability to explain complex processes through simulation and modelling. Ability to express complex and technical concepts orally in a simple, precise and straightforward language for better understanding.
PO3	**CRITICAL THINKING**	Ability to distinguish between relevant and irrelevant facts and information, discriminate between objective and biased information, apply logic to arrive at definitive conclusions, find out if conclusions are based upon sufficient evidence, derive correct quantitative results, make rational evaluations, and arrive at qualitative judgments according to established rules.
PO4	**SENSE OF INQUIRY**	Ability to distinguish between relevant and irrelevant facts and information, discriminate between objective and biased information, apply logic to arrive at definitive conclusions, find out if conclusions are based upon sufficient evidence, derive correct quantitative results, make rational evaluations, and arrive at qualitative judgments according to established rules.

PO5	**TEAM PLAYER/WORKER**	Capable of working effectively in diverse teams in both classroom, laboratory, Physics workshop and in field-based situation
PO6	**SKILLED PROJECT MANAGER**	Capable of identifying/mobilizing appropriate resources required for a project, and managing a project through to completion, while observing responsible and ethical scientific conduct, safety and laboratory hygiene regulations and practices.
PO7	**DIGITALLY EFFICIENT**	Capable of using computers for computational and simulation studies in Physics. Proficiency in appropriate software for numerical and statistical analysis of data, accessing and using modern e-library search tools like - to locate, retrieve, and evaluate Physics information from renowned physics archives, accessing observational and experimental data made available by renowned research labs for further analysis
PO8	**ETHICAL AWARENESS/ ANALYTICAL REASONING**	The graduate should be capable of demonstrating the ability to think and analyze rationally with modern and scientific outlook and adopt objectives, which are unbiased and truthful in all aspects of work. She/he should be capable of identifying ethical issues related to one's work. She/he should be ready to appropriately acknowledge, direct and indirect contributions received from all sources, including from other personnel's in the work field. Willing to contribute to the free development of knowledge in all forms. Further, unethical behavior such as fabrication, falsification or misrepresentation of data, or committing plagiarism, or not adhering to intellectual property rights should be avoided.
PO9	**SOCIAL, NATIONAL AND INTERNATIONAL PERSPECTIVE**	The graduates should be able to develop a social perspective about the significance of their knowledge and skills for social well-being. They should have a national as well as an international perspective for their work and career in the chosen field of academic and research activities.
PO10	**LIFE LONG LEARNERS**	Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Physics.
PO11	**INVESTIGATION OF PROBLEMS**	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
PO12	**MODERN TOOL USAGE**	Ability to use and learn techniques, skills and modern tools for scientific practices
PO13	**SCIENCE AND SOCIETY**	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the

		professional scientific practices
PO14	**ENVIRONMENT AND SUSTAINABILITY**	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development
PO15	**ETHICS**	Apply ethical principles and professional responsibilities in scientific practices
PO16	**PROJECT MANAGEMENT**	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects
PO 17	**INVESTIGATION OF PROBLEMS**	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions

PROGRAMME SPECIFIC OUTCOMES

After successful completion programme, the students will be able to:

PSO1: Acquire an in-depth understanding and knowledge of the basic concepts of physics and be able to appreciate how diverse phenomena observed in nature follow from a small set of fundamental laws through logical reasoning.

PSO2: Be capable of understanding the core physical laws to understand the basic concepts, latest progress and applications of certain sub fields such as nuclear physics, spectroscopy of atoms & molecules, solid state physics, computational physics & electronics.

PSO3: Gain hands-on skills for carrying out basic experiments as well as experiments related to different fields of Physics and attain abilities of critical thinking, problem mapping & solving using fundamental principles of Physics, systematic analysis & interpretation of results.

PSO4: Have a new perspective to look at everything from 'Scientific' point of view that enabling them to pursue higher studies at postgraduate & research level

PSO5: Have awareness of the impact of Physics in social, economical and environmental issues.

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
DPS Institute of Higher Learning
Khanpur

BHAGAT PHOOL SINGH MAHILAVISHWAVIDYALAYA, KHANPUR KALAN(SONEPAT)

(State University established under legislature act xxxi of 2006)

Course Curriculum & Scheme of Examination

For Physics

B. Sc. I (Non Medical / Computer Science)

1st Semester

S. No.	Paper Code	Course Title	Teaching Schedule			Internal Assessment	External Assessment	Credit (Hrs)	Total Marks
			L	T	P				
Paper-I	PHY-101-A	Classical Mechanics and Theory of Relativity	3	0	0	10	40	3	50
Paper-II	PHY-101-B	Electricity, Magnetism and Electromagnetic Theory	3	0	0	10	40	3	50
Paper-III	PHY-101	Practical	0	0	4	10	40	2	50
Total Credits /marks			6	0	4	30	120	8	150

2nd Semester

S. No.	Paper Code	Course Title	Teaching Schedule			Internal Assessment	External Assessment	Credit (Hrs)	Total Marks
			L	T	P				
Paper-I	PHY-102-A	Properties of Matter and Kinetic Theory of gases	3	0	0	10	40	3	50
Paper-II	PHY-102-B	Semiconductor Devices	3	0	0	10	40	3	50
Paper-III	PHY-102	Practical	0	0	4	10	40	2	50
Total Credits /marks			6	0	4	30	120		150

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
BPS Institute of Higher Learning
Khanpur Kalan (Sonepat)

Note:

1.Pracical examination will be held at the end of each semester.

2.Pass percentage is 40% and It is necessary to pass in theory and Practical Paper separately.

3.One Day Scientific tour is compulsory.

BHAGAT PHOOL SINGH MAHILAVISHWAVIDYALAYA, KHANPUR KALAN(SONEPAT)

(State University established under legislature act xxxi of 2006)

Course Curriculum & Scheme of Examination for Physics
B. Sc. II (Non Medical / Computer Science)

3rd Semester

S. No.	Paper Code	Course Title	Teaching Schedule			Internal Assessment	External Assessment	Credit (Hrs)	Total Marks
			L	T	P				
Paper-I	PHY-201- A	Computer Programming and Thermodynamics	3	0	0	10	40	3	50
Paper-II	PHY-201-B	Wave and Optics - I	3	0	0	10	40	3	50
Paper-III	PHY-201	Practical	0	0	4	10	40	2	50
Total Credits /marks			6	0	4	30	120	8	150

4th Semester

S. No.	Paper Code	Course Title	Teaching Schedule			Internal Assessment	External Assessment	Credit (Hrs)	Total Marks
			L	T	P				
Paper-I	PHY-202-A	Statistical Physics	3	0	0	10	40	3	50
Paper-II	PHY-202-B	Wave and Optics - II	3	0	0	10	40	3	50
Paper-III	PHY-202	Practical	0	0	4	10	40	2	50
Total Credits /marks			6	0	4	30	120	8	150

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
BPS Institute of Higher Learning
Khanpur Kalan (Sonepat)

Note:

1.Pracical examination will be held at the end of each semester.

2.Pass percentage is 40% and It is necessary to pass in theory and Practical Paper separately.

3.One Day Scientific tour is compulsory.

BHAGAT PHOOL SINGH MAHILAVISHWAVIDYALAYA, KHANPUR KALAN(SONEPAT)

(State University established under legislature act xxxi of 2006)

Course Curriculum & Scheme of Examination for Physics

B. Sc. III (Non Medical / Computer Science)

5rd Semester

S. No.	Paper Code	Course Title	Teaching Schedule			Internal Assessment	External Assessment	Credit (Hrs)	Total Marks
			L	T	P				
Paper-I	PHY-301-A	Quantum and Laser Physics	3	0	0	10	40	3	50
Paper-II	PHY-301-B	Nuclear Physics	3	0	0	10	40	3	50
Paper-III	PHP-301	Practical	0	0	4	10	40	2	50
Total Credits /Marks			6	0	4	30	120	8	150

6th Semester

S. No.	Paper Code	Course Title	Teaching Schedule			Internal Assessment	External Assessment	Credit (Hrs)	Total Marks
			L	T	P				
Paper-I	PHY-302-A	Solid State and Nano Physics	3	0	0	10	40	3	50
Paper-II	PHY-302-B	Atomic and Molecular Spectroscopy	3	0	0	10	40	3	50
Paper-III	PHP-302	Practical	0	0	4	10	40	2	50
Total Credits /Marks			6	0	4	30	120	8	150

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
BPS Institute of Higher Learning
Khanpur Kalan (Sonepat)

Note:

1.Practical examination will be held at the end of each semester

2. Pass percentage is 40% and It is necessary to pass in theory and Practical Paper separately.

3.One Day scientific tour is compulsory.

B.Sc. I(Non Medical/Computer Science)
Semester – I
Subject: Physics
Paper-I
Classical Mechanics and Theory of Relativity

Course code : PHY-101- A **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

• The emphasis of this course is to enhance the basics of mechanics and theory of relativity.

• To expose students to fundamental physics and hence enable them to solve a wide range of seen or unseen problems/numerical in vectors, differential equations and mechanics.

• The course provides physical picture of mathematical topics like vector and Ordinary differential equations and ends on covariant formulation of space-time in special theory of relativity.

• To help students to enhance the understanding of laws of mechanics and their application to moving systems.

• Students should be able to do problems on rectilinear and rotational motion, stability of a system, moment of inertia, simple harmonic motion and special theory of relativity.

• The emphasis here is to develop critical skills and knowledge that will prepare them not only for doing fundamental and applied research but also prepare them for a wide variety of careers.

Note:-

1. Nine Questions will be set in total.
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT I: Basic concepts of Classical mechanics

Mechanics of single and system of particles, Conversion law of linear momentum, Angular momentum and mechanical energy for a particle and a system of particles, Centre of Mass and equation of motion, Constrained Motion.

UNITII: Generalized Notations

Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement, Velocity, Acceleration, Momentum, Force and Potential, Hamilton's variational principle, Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.

UNIT III: Theory of relativity

Frame of reference, limitation of Newton's law of motion, Inertial frame of reference, Galilean transformation, Frame of reference with linear acceleration, Classical relativity- Galilean invariance, Transformation equation for a frame of reference- inclined to an inertial frame and Rotating frame of reference, Non-inertial frames-The accelerated frame of reference and rotating frame of reference , Effect of centrifugal and coriolis forces due to Earth's rotation, Fundamental frame of reference, Michelson- Morley's experiment, concept of Einstein's relativity.

UNIT IV: Applications of theory of relativity

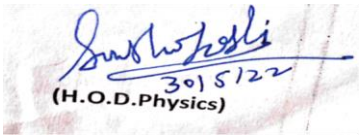
Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance, Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence, Transformation of relativistic momentum and energy, relation between relativistic momentum and energy, Mass, velocity, momentum and energy of zero rest mass.

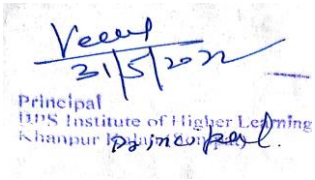
Reference:

1. Classical Mechanics by H. Goldstien (2nd Edition).
2. Berkely Physics Course. Vol. 1. Mechanics by E.M.Purcell
3. Concepts of Modern Physics by Arthur Beiser
4. Mechanics by D.S.Mathur.

Course Learning Outcomes

- Upon completion of this course, students are expected to understand the following concepts which would help them to appreciate the application of the fundamental concepts to the analysis of simple, practical situations related to the real world:
- Understand the role of vectors and coordinate systems in Physics.
- Learn to solve Ordinary Differential Equations: First order, Second order Differential Equations with constant coefficients'
- Understand laws of motion and their application to various dynamical situations.
- Learn the concept of Inertial reference frames and Galilean transformations. Also, the concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
- Understand the analogy between translational and rotational dynamics, and application of both motions simultaneously in analyzing rolling with slipping.
- Understand variable mass system and dynamics of a system of particles.
- Able to write the expression for the moment of inertia about the given axis of symmetry for different uniform mass distributions.
- Understand the phenomena of elastic and in-elastic collisions
- Understand angular momentum of a system of particle.





B.Sc. I(Non Medical/Computer Science)
Semester – I
Subject: Physics
Paper-II
Electricity, Magnetism and Electromagnetic theory

Course code : PHY-101-B **Total Credits :3 L-T-P:3-0-0**

Total Marks-50 External Marks:40

Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

Vector Analysis: Review of vector algebra (Scalar and Vector product), Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).

Note:-

1. Nine Questions will be set in total.
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT I: Vector background and Electric field

Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Derivation of electric field E from potential as gradient, Derivation of Laplace and Poisson equations, Electric flux, Gauss's Law, Mechanical force of charged surface, Energy per unit volume.

UNIT II: Magnetism

Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction, properties of (i) , (ii) , Electronic theory of dia and paramagnetism,
Domain theory of ferromagnetism (Langevin's theory), Cycle of magnetization- hystresis loop (Energy dissipation, Hystresis loss and importance of Hystresis Curve)

UNIT III:Electromagnetism

Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials, Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem.

UNIT IV: A. C. Analysis

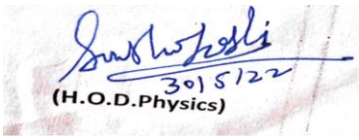
A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR) (b) Resistance and Inductance (LR) (c) Capacitance and Inductance (LC) and (d) Capacitance, Inductance and Resistance (LCR),
Series and parallel resonance circuit, Quality factor (sharpness of resonance).

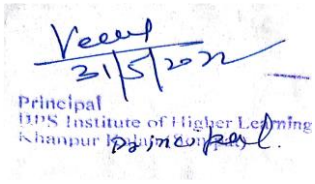
Reference:

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India).
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGrawHill)

Course Learning Outcomes

- Have basic knowledge of Vector Calculus: Vector integration (line, surface and volume), Gauss-divergence theorem and Stoke's theorem
- Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.
- Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.
- Apply Gauss's law of electrostatics to solve a variety of problems.
- Articulate knowledge of electric current, resistance and capacitance in terms of electric field and electric potential.
- Demonstrate a working understanding of capacitors
- Calculate the magnetic forces that act on moving charges and the magnetic fields due to currents (Biot-Savart and Ampere laws)
- Have brief idea of dia-, para and ferro-magnetic materials
- Understand the concepts of induction and self-induction, to solve problems using Faraday's and Lenz's laws
- Have an introduction to Maxwell's equations.
- In the Lab course, students will be able to measure resistance (high and low), Voltage, Current, self and mutual inductance, capacitor, strength of magnetic field and its variation, study different circuits RC, LCR etc.





B.Sc. I(Non Medical/Computer Science)
Semester – I
Subject: Physics
Paper-III
Practicals

Course Code: PHP-101 **Total Credits: 3** **L-T-P 3-0-0**
Total Marks:50

External Marks:40
(25+8+7)
(Experiment+copy+Viva Voice)

Course Objective

- Demonstration cum laboratory sessions on the construction and use of Vernier callipers, screw gauge and travelling microscope, and necessary precautions during their use.
- Sessions and exercises on the least count errors, their propagation and recording in final result up to correct significant digits, linearization of data and the use of slope and intercept to determine unknown quantities.
- Session on the writing of scientific laboratory reports, which may include theoretical and practical significance of the experiment performed, apparatus description, relevant theory, necessary precautions to be taken during the experiment, proper recording of observations, data analysis, estimation of the error and explanation of its sources, correct recording of the result of the experiment, and proper referencing of the material taken from other sources

Internal Marks : 10(5+5)(Attendance+ Seminar)

Special Notes:-

1. **Do any ten experiments**
2. **The students are required to calculate the error involved in a particular experiment**

Experiments:-

1. To find out the moment of inertia of fly wheel .
2. To find out the moment of Inertia of irregular body using a Torsion Pendulum.
3. To find the Young Modulus by Bending of Beam.
4. To find modulus of rigidity of material of wire by Maxwell's Needle.
5. To find Young's modulus, modulus of rigidity and Poisson's ratio for the material of a wire by Searle's method.
6. To determine the surface tension of water by Jaeger's Method
7. To find the coefficient of viscosity of water by noting its flow through a capillary tube
8. To find out the value of g by bar pendulum.
9. To find out the value of radius of gyration by bar pendulum.
10. To study the basics of computer like MS-WORD, MS EXCEL and PowerPoint.
11. One day scientific tour

Note:-

1. Practical examination will be held at the end of each semester.
2. Pass percentage is 40% and its necessary to pass in practical paper separately.
3. The students are required to calculate the error involved in a particular experiment.
4. Minimum ten experiments have to be done.
5. The practical examination will be held in 3 hours
6. Experiment Examination marks:-50

Distribution of marks:

ExternalExamination:40(Experiment+copy+Viva-Voice)(25+8+7)

Internal Examination: 10(5+5) (Attendance +Seminar)

Total Marks: 50

7. For giving marks and lab record each college will maintain practical assessment record by using following procedure given below.
8. Each student has to perform a minimum number of experiment prescribed in the syllabus.
9. After completion of practical, the teacher concern will check the notebook and conduct viva-voice of each student to find out how much concepts related to the theoretical and experimental part of experiment she has understood. According to her performance marks will be recorded on their practical notebook. These marks will contribute the lab record.
10..To compute the final marks for lab record, a separate register will be maintained. Each student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be entered. his record will be signed by concerned teacher.
11.One day scientific tour is compulsory.

Course Learning Outcomes

- Hands on experience with different instruments and appreciate the beauty of different concepts and related experiments in Physics.
- Verify some fundamental principles, effects and concepts of physics through Experiments.
- perform experiments related to mechanics (compound pendulum), rotational dynam(Flywheel), elastic properties (Young Modulus and Modulus of Rigidity) and fluid dynamics (verification of Stokes law, Searle method) etc
- Learn to present observations, results and analysis in suitable and presentable form.
- Learn the basics of computer.

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
DDS Institute of Higher Learning
Khanpur Kalan

B.Sc. I(Non Medical/Computer Science)
Semester – II
Subject: Physics
Paper-I
Properties of Matter and Kinetic Theory of Gases

Course code : PHY-102- A **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

1. To know the basic principles of properties of matter i.e. moment of Inertia and Elasticity.
2 .The kinetic theory of gases explains the macroscopic properties of gases.

Note:-

1. Nine Questions will be set in total
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/No.
3. For more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT I: Moment of inertia

Rotation of rigid body, Moment of inertial, Torque, angular momentum, Kinetic Energy of rotation. Theorem of perpendicular and parallel axes (with proof), Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder andsolid bar of rectangular cross–section, Fly wheel, Moment of inertia of an irregular body,Acceleration of a body rolling down on an inclined plane.

UNIT II: Elasticity

Elasticity, Stress and Strain, Hook's law, Elastic constant and their relations, Poisson's ratio, Torsion of cylinder and twisting couple, Determination of coefficient of modulus of rigidity for the material of wire by Maxwell's needle, Bending of beam (Bending moment and its magnitude), Cantilever and Centrally loaded beam, Determination of Young's modulus for the material of the beam and Elastic constants for the material ofthe wire by Searle's method.

UNIT III: Kinetic theory of gases-I

Assumption of Kinetic theory of gases, pressure of an ideal gas (with derivation), Kineticinterpretation of Temperature, Ideal Gas equation, Degree of freedom, Law of equipartition of energy and its application for specific heat of gases, Real gases, Vander wall's equation, Brownian motion(Qualitative)

UNIT IV: Kinetic theory of gases-II

Maxwell's distribution of speed and velocities (derivation required), Experimental verification of Maxwell's law of speed distribution: most probable speed, average and r.m.s. speed, Mean free path, Transport of energy and momentum, Diffusion of gases.

Reference:

1. Properties of Matter by D.S. Mathur.
2.Heat and Thermodynamics (5th Edition) by Mark W. Zermansky.
3.Berklely PhysicsCourse,Vol.1 Mechanics By E.M. Purchell.

Course Learning Outcomes

- Properties of matter identify and describe various properties of matter including moment of inertia of solid sphere, hollow sphere acceleration of body etc.
- By the end of the course the students will know about the concepts of elastic nature of a material,the bending of beams .
- Learn the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equitation of energies, mean free path of molecular collisions, viscosity, thermalconductivity, diffusion and Brownian motion.
- Learn about the real gas equations, Van der Waal equation of state, the Joule-Thompson effect.
- In the laboratory course, the students are expected to do some basic experiments in thermal Physics, viz., determinations of Stefan's constant, coefficient of thermal conductivity etc.

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
DDS Institute of Higher Learning
Khanpur Kalan

B.Sc. I(Non Medical/Computer Science)
Semester – II
Subject: Physics
Paper-II
Semiconductor Devices

Course code : PHY-102- B **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- Semiconductor devices deals semiconductor diodes, amplifiers , rectifiers and oscillators
- To understand how to make power supply and other electronics devices.

Note:-

1. Nine Questions will be set in total.
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT I: Semiconductors

Energy bands in solids, Intrinsic and extrinsic semiconductors, carrier mobility and electrical resistivity of semiconductors, Hall effect, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode, Zener diode as a voltage regulator. Light emitting diodes (LED), Photoconduction in semiconductors, Photodiode, Solar Cell, p-n junction as a rectifier, half wave and full wave rectifiers (with derivation), filters (series inductor, shunt capacitance, L-section or choke, π and R.C. filter circuits).

UNIT II: Transistors

Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes),Common base, common emitter and common collector characteristics of transistor, Constants of a transistor and their relation, Advantages and disadvantages of C-E configuration. D.C. load line .Transistor biasing; various methods of transistor biasing and stabilization.

UNIT III: Transistor Amplifiers

Amplifiers, Classification of amplifiers, common base and common emitter amplifiers, coupling of amplifiers, various methods of coupling, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation), Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers.

UNIT IV: Oscillators

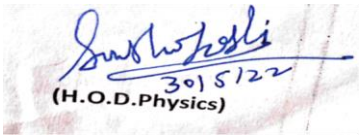
Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation: Barkhausen criterion for oscillation, Tuned collector common emitter oscillator, Hartley oscillator, C.R.O. (Principle and Working).

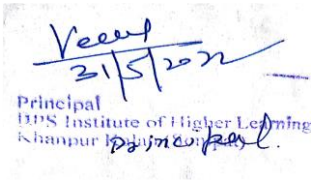
Reference:

1. Basic Electronics and Linear Circuits by N.N.Bhargava. D.C. Kulshreshtha and S.C.Gupta (TITI CHD).
2. Solid State Electronics by J.P.Agarwal, Amit Agarwal (Pragati Prakashan Meerut).
3. Electronics Fundamentals and Applications by J.D. Ryder (Prentice Hall India)
4. Solid State Electronics by B.L.Theraja

Course Learning Outcomes

- N- and P- type semiconductors, mobility, drift velocity, fabrication of P-N junctions; forward and reverse biased junctions.
- Application of PN junction for different type of rectifiers and voltage regulators.
- NPN and PNP transistors and basic configurations namely common base, common emitter and common collector, and also about current and voltage gain.
- Biasing and equivalent circuits, coupled amplifiers and feedback in amplifiers and oscillators.
- To characterize various devices namely PN junction diodes, LEDs, Zener diode, solar cells, PNP and NPN transistors. Also construct amplifiers and oscillators using discrete components.





B.Sc. I (Non Medical +Computer Science)

Semester-III

Subject:Physics

Paper III

Practicals

Course Code: PHP-102 **Total Credits: 3 L-T-P:3-0-0**
Total Marks:50

External Marks:40(25+8+7)
(Experiment+copy+Viva Voice)
Internal Marks : 10(5+5)
(Attendance+Seminar)

Course Objective

- Students will be able to understand the digital circuits
- Able to understand zener diode,solar cell,carey foster bridge etc.
- We can find out the low resistance and high registance.
- Dedicated demonstration cum laboratory sessions on the construction, functioning and uses of different electrical bridge circuits, and electrical devices like the ballistic galvanometer.
- Sessions on the review of scientific laboratory report writing, and on experimental data analysis, least square fitting, and computer programme to find slope and intercept of straight-line graphs of experimental data.
- Gain the knowledge of Python Language.

Special Notes:-

1. Do any ten experiments
2. The students are required to calculate the error involved in a particular experiment

Experiments:-

1) To study forward and reverse characteristics of semiconductor diode.
2) To study the characteristics of Zener diode
3) To study the characteristics of Solar cell and find out the Fill Factor.
4) To study AND, OR and NOT Gate.
5) To study NAND and NOR Gate.
6) To find out the low resistance by Carey Foster bridge.
7) To find out high resistance by substitution method.
8) To verify the inverse square law by photo- cell.
9) To find out the E.C.E of Hydrogen using water Voltammeter.
10) To find out frequency of A.C. main by Sonometer.
11) To find out frequency of A.C. mains Electrical vibrator.
12) To find out the impedance of A.C. mains in given circuit.
13) To find out inductance byAnderson bridge method
14) To study the phenomenon of electro-magnetic induction by Python language.
15) To find out value of G using Python language.
16) To plot the forward and reverse characteristics of diode using Python language.

17) Project work compulsory.
18) One day scientific tour compulsory.

Note:-

1. Practical examination will be held at the end of each semester.
2. Pass percentage is 40% and its necessary to pass in practical paper separately.
3. The students are required to calculate the error involved in a particular experiment.
4. Minimum ten experiments have to be done.
5. The practical examination will be held in 3 hours
6. Experiment Examination marks:-50

Distribution of marks:-

External Examination: 40 (Experiment+copy+Viva-Voice)(25+8+7)

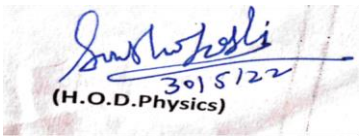
Internal Examination: 10(5+5) (Attendance+Seminar)

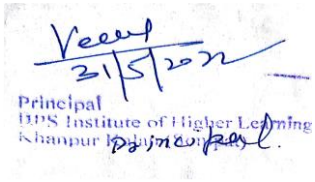
Total Marks: 50

7. For giving marks and lab record each college will maintain practical assessment record by using following procedure given below.
8. Each student has to perform a minimum number of experiment prescribed in the Syllabus.
9. After completion of practical, the teacher concern will check the notebook and conduct viva-voice of each student to find out how much concepts related to the theoretical and experimental part of experiment she has understood. According to her performance marks will be recorded on their practical notebook. These marks will contribute the lab record.
10. To compute the final marks for lab record, a separate register will be maintained. Each student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be entered. his record will be signed by concerned teacher.
11. One day scientific tour is compulsory.

Course Learning Outcomes

- Hands on experience with the uses of multimeter.
- Characterize various devices namely PN junction diodes, LEDs, Zener diode, solar cells, PNP and NPN transistors.
- Perform the experiments to determine the values of frequency of A.C. mains, values of low and high resistances using different methods and be able to appreciate the concepts of physics involved in these experiments.
- Learn to present observations, results and analysis in suitable and presentable form.





B.Sc. II(Non Medical/Computer Science)
Semester – III
Subject: Physics
Paper-II Computer Programming and Thermodynamics

Course code : PHY-201-A **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- This course is intended to give an insight to computer hardware and computer applications. Students will familiarize with use of computer to solve physics problems.
- They will learn a programming language namely Fortran and applications of Fortran based programmes.
- This course will also introduce Thermodynamics; the primary goal is to understand the fundamental laws of thermodynamics and its applications to various thermo dynamical systems and processes.

Note:

1. The syllabus is divided into 4 units. 9 questions will be set.
2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.
3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts. All questions carry equal marks
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT-I: Computer Programming

Computer organization, Binary representation, Algorithm development, Flow charts and their interpretation. FORTRAN Preliminaries: Integer and floating point arithmetic expression, built in functions, executable and non-executable statements, input and output statements, Formats, IF, DO and GO TO statements, Dimension arrays, statement function and function subprogram.

UNIT –II: Applications of FORTRAN programming

Algorithm, Flow Chart and Programming for Print out of natural numbers, Range of the set of given numbers, Ascending and descending order, Mean and standard deviation, Least square fitting of curve, Roots of quadratic equation, Product of two matrices, Numerical integration (Trapezoidal rule and Simpson 1/3 rule) .

UNIT-III: Thermodynamics-I

Thermodynamic system and Zeroth law of thermodynamics. First law of thermodynamics and its limitations, reversible and irreversible process. Second law of thermodynamics and its significance, Carnot theorem, Absolute scale of temperature, Absolute Zero and magnitude of each division on work scale and perfect gas scale, Joule's free expansion, Joule Thomson effect, Joule-Thomson (Porous plug) experiment, conclusions and explanation, analytical treatment of Joule Thomson effect. Entropy, calculations of entropy of reversible and irreversible process , T-S diagram, entropy of a perfect gas, Nernst heat law(third law of thermodynamics), Liquefaction of gases, (oxygen, air, hydrogen and helium), Solidification of He below 4K, Cooling by adiabatic demagnetization.

UNIT-IV: Thermodynamics-II

Derivation of Clausius-Clapeyron and Clausius latent heat equation and their significance,specific heat of saturated vapours,phase diagrame and triple point of a substance, development of Maxwell thermodynamical relations. Thermodynamical functions: Internal energy (U), Helmholtz function (F),

Enthalpy (H), Gibbs function (G) and the relations between them, derivation of Maxwell thermodynamical relations from thermodynamical functions,Application of Maxwell relations: relations between two specific heats of gas, Derivation of Clausius-Clapeyron and Clausius equation,variation of intrinsic energy with volume for (i) perfect gas (ii)Vanderwall gas (iii)solids and liquids , derivation of Stefans law, adiabatic compression and expansion of gas & deduction of theory of Joule Thomson effect.

References:

1 Ian C and Malcon C, Interactive FORTRAN 77, Affiliated East West Press Pvt Ltd, New Delhi

2 Rajaraman V, Computer Programming in FORTRAN 77, Prentice-Hall of India Pvt Ltd, New Delhi.

3 Suresh C, Computer Applications in Physics, Narosa ublishing House, New Delhi

4 Roy S K, Thermal Physics and Statistical Mechanics, New Age International Publishers, New Delhi

5 Sharma J K and Sarkar K K, Thermodynamics and Statistical Physics, Himalaya Publishing House, Bambay

6 Stowe Keith, Introduction to Thermodynamics and its Applications, University press (India) Pvt Ltd, Hyderabad

7 Infelta Pierre P. Introductory Thermodynamics Publisher: BrownWalker Press

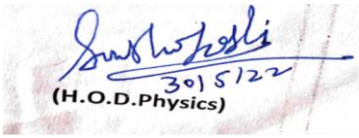
8 Johnson J. K, Fundamentals of Thermodynamics University of Pittsburgh 2009

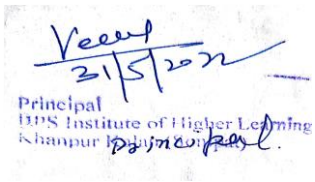
9 Jefferson Tester, Michael Modell, Thermodynamics and Its Applications 3rd Edition

10 Thomas Engel, Philip Reid, Thermodynamics, Statistical Thermodynamics, & Kinetics 2nd Edition

Course Learning Outcomes

- Write algorithm and flow chart for fotran-programming language.
- To use of iterative, decision making and the jump statement.
- Understand the concept of arrays and pointers.
- Study of user defined functions and program structures.
- Able to use the concept graphics in Fortran language.
- Learn the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic functions and their physical interpretations.
- They are also expected to learn Maxwell's thermodynamic relations and applications of Maxwell relations.





B.Sc. II(Non Medical/Computer Science)
Semester – IV
Subject: Physics
Wave and optics I

Course code : PHY-201-B **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- In this course phenomena in which the wave properties of light are important such as interference and diffraction with emphasis of examples as seen in daily life.
- Study the different spectra with sodium lamp and Mercury Lamp with prism and grating etc.
-

Note:

1. The syllabus is divided into 4 units. 9 questions will be set.
2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.
3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts .All questions carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT-I: Interference I

Interference by Division of Wave front: Young's double slit experiment, Coherence, Conditions of interference, Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror, Difference between Bi-prism and Llyod mirror fringes, phase change on reflection.

UNIT II: Interference II

Interference by Division of Amplitude: Plane parallel thin film, production of colors in thin films, classification of fringes in films, Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings, Interferometer: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength.

UNIT- III: Diffraction I

Fresnel's diffraction: Fresnel's assumptions and half period zones, rectilinear propagation of light, zone plate, diffraction at a straight edge, rectangular slit and circular aperture, diffraction due to a narrow slit and wire.

UNIT -IV: Diffraction II

Fraunhoffer diffraction: single-slit diffraction, double-slit diffraction, N-slit diffraction, plane transmission granting spectrum, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra.

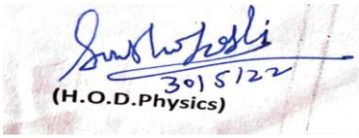
References

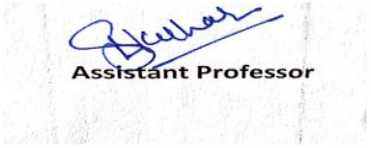
1 Hecht, Optics, Pearson Education, New Delhi 2 Brooker G, Modern Classical Optics, Ane Books Pvt Ltd, New Delhi
3 Chaudhuri R N, Waves and Oscillations, New Age International Publishers, New Delhi
4 Khandelwal D P, Text Book of Optics and Atomic Physics, Himalaya Publishing House, Bombay

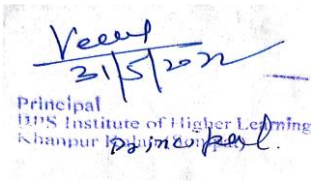
5 Subrahmanyam N, Lal B, Avadhanulu M N, A Text Book of Optics, S Chand & Co, New Delhi
6 Barton A w, atext Book on Light, Longmans Green & Co London.
7 Longhurst R S, Geometrical and Physical Optics, University Press India Pvt.Ltd. Hyd.

Course Learning Outcomes

- Understand Interference as superposition of waves from coherent sources derived from same parent source
- Demonstrate understanding of Interference experiments: Young's Double Slit, Fresnel's biprism, Llyod's Mirror, Newton's Rings.
- Construction and working of Michelson's Interferometer.
- Demonstrate basic concepts of Diffraction: Superposition of wavelets diffracted from apertures
- Understand Fraunhoffer Diffraction from a slit.
- In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. Resolving power of optical equipment can be learnt







B.Sc. II (Non Medical +Computer Science)

Semester-III

Subject:Physics

Paper III

Practicals

Course Code: PHP-201 **Total Credits: 3 L-T-P 3-0-0**
Total Marks:50
External Marks:40(25+8+7)
(Experiment+copy+Viva Voice)
Internal Marks : 10(5+5)
(Attendance+Seminar)

Course learning objectives

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory i.e. Optics
- To learn the usage of electrical and optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data
- To develop intellectual communication skills and discuss the basic principles of principles of scientific concepts in a group.
- To gain the knowledge of sodium lamp, mercury lamp and different Spectra.

Special Notes:-

1. Do any ten experiments
2. The students are required to calculate the error involved in a particular experiment

Experiments:-

1) To measure the area of window and height of an accessible object using sextant.
2) To find out refractive index of prism by spectrometer.
3) To find out the dispersive power of prism by spectrometer.
4) To study the graph of wavelength versus minimum deviation for various lines from mercury discharge source.
5) To determine the wavelength of sodium light using diffraction grating.
6) To determine the wavelength of light using by Newton ring method.
7) To compare the illuminating power by photometer.
8) To find out the resolving power of telescope.
9) To print out all natural numbers between given limits using computer.
10) To write program for roots of quadratic equations.
11) To find the maximum, minimum and range of given set of number using computer.
12) To find the sum of finite series.
13) To find out the area of triangle.
14) To find out the are of sphere.

15) To find out area of cylinder.
16) To find the integration of definite integral by Trapezodial rule.
17) Project work compulsory.
18) One day scientific tour compulsory.

Note:-

1. Practical examination will be held at the end of each semester.
2. Pass percentage is 40% and its necessary to pass in practical paper separately.
3. The students are required to calculate the error involved in a particular experiment.
4. Minimum ten experiments have to be done.
5. The practical examination will be held in 3 hours
6. Experiment Examination marks:-50

Distribution of marks:-

External Examination: 40 (Experiment+copy+Viva-Voice)(25+8+7)

Internal Examination: 10(5+5) (Attendance+Seminar)

Total Marks: 50

7.For giving marks and lab record each college will maintain practical assessment record by using following procedure given below.

8.Each student has to perform a minimum number of experiment prescribed in the syllabus.

9. After completion of practical, the teacher concern will check the notebook and conduct viva-voice of each student to find out how much concepts related to the theoretical and experimental part of experiment she has understood. According to her performance marks will be recorded on their practical notebook. These markswill contribute the lab record.

10. To compute the final marks for lab record, a separate register will be maintained. Each student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be entered. his record will be signed by concerned teacher.

11. One day scientific tour is compulsory.

COURSE LEARNIG OUTCOMES

Hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. and resolving power of optical equipment.

Understand various optical phenomena, principles, workings and applications optical instruments through Experiments.

Learn to present observations, results and analysis in suitable and presentable form.

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
BPS Institute of Higher Learning
Khanpur

B.Sc. II(Non Medical/Computer Science)
Semester – IV
Subject: Physics
Paper-II
Statistical Physics

Course code : PHY-202-A **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- This coursework will also enable the students to understand the connection between the macroscopic observations of physical systems and microscopic behavior of atoms and molecules through Statistical mechanics.
- Understand statistical distribution of system of particles.

Note:

1. The syllabus is divided into 4 units. 9 questions will be set.
2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.
3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts. All questions carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT –I: Statistical Physics I

Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent. Probability, statistical probability, A- priori Probability and relation between them, probability theorems, some probability considerations, combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of Coins, Permutations and combinations, distributions of N (for N= 2,3,4) distinguishable and indistinguishable particles in two boxes of equal size, Micro and Macro states, Thermodynamical probability, Constraints and Accessible states, Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact—β parameter, Entropy and Probability (Boltzman's relation).

UNIT –II: Statistical Physics II

Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics. M. B. statistics applied to an ideal gas in equilibrium-energy distribution law (including evaluation of σ and β) , speed distribution law & velocity distribution law. Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian distribution.

UNIT-III: Quantum Statistics

Need for Quantum Statistics: Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E. gas, Degeneracy and B.E. Condensation, Fermi- Dirac energy distribution law, F.D. gas and Degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution

law, Fermi Dirac gas and degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law for electron gas in metals, Zero point energy, Zero point pressure and average speed (at 0 K) of electron gas, Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, Comparison of three statistics.

UNIT-IV: Theory of Specific Heat of Solids

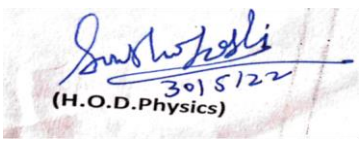
Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature, Einstein theory of specific heat, Criticism of Einstein theory, Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories.

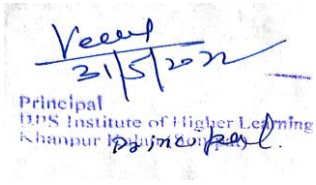
References:

1. Prakash S and Agarwal J P, Statistical Mechanics, Kedar Nath Ram Nath & co, Meerur
2. ReifF. statistical Physics, Berleley Physics Course Volume 5, Mc Graw Hill Book Co Ltd, New Delhi
3. Mc Quarrie D A. Statistical Mechanics, Viva Books Pvt Ltd, New Delhi.
4. Ashley Cmter (August 1999), Classical and Statistical Thermodynamics .
5. Richard Fitzpatrick, Thermodynamics and Statistical Mechanics: An intermediate level course Lulu.com,2007

Course learning outcomes

- Understand the concepts of microstate, macrostate, ensemble, phase space, thermodynamic probability and partition function.
- Understand the studies of particles with their distinguishably or indistinguishably nature and conditions which lead to the three different distribution laws e.g. Maxwell-Boltzmann distribution, Bose-Einstein distribution and Fermi-Dirac distribution laws of particles and their derivation.
- Comprehend and articulate the connection as well as dichotomy between classical statistical mechanics and quantum statistical mechanics.
- Learn to apply the classical statistical mechanics to derive the law of equipartition of energy and specific heat.
- Understand the Gibbs paradox, equipartition of energy and concept of negative temperature in two level system.
- Learn to derive classical radiation laws of black body radiation. Wiens law, Rayleigh Jeans law.
- Learn to calculate the macroscopic properties of degenerate photon gas using BE distribution law, understand Bose-Einstein condensation law and liquid Helium. Bose
- derivation of Plank's law
- Understand the concept of Fermi energy and Fermi level, calculate the macroscopic properties of completely and strongly degenerate Fermi gas, electronic contribution to specific heat of metals.
- Understand the application of F-D statistical distribution law to derive thermodynamic functions of a degenerate Fermi gas, electron gas in metals and their properties..





B.Sc. II(Non Medical/Computer Science)
Semester – IV
Subject: Physics
Wave and Optics II

Course code : PHY-202-B **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- Study polarization of light and it applications.
- Learn about the Fourier transform, the inverse Fourier transform. their properties and their applications in physical problems.

Note:

1. The syllabus is divided into 4 units. 9 questions will be set.
2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) andanswer should be brief but not in yes / no.
3. Four more questions are to be attempted, selecting one question from each unit.Questions 2-9 may contain two or more parts. All questions carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT-1: Polarization

Polarization: Polarisation by reflection, refraction and scattering, Malus Law,Phenomenon of double refraction, Huygen's wave theory of double refraction (Normaland oblique incidence), Analysis ofpolarized Light. Nicol prism, Quarter wave plate andhalf wave plate, production and detection of (i) Plane polarized light (ii) Circularlypolarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory ofoptical rotation, Specific rotation, Polarimeters (half shade and Biquartz).

UNIT-II: Fourier analysis

Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance andlimitations of Fourier theorem, even and odd functions, Fourier series of functions f(x)
between (i) 0 to 2pi, (ii) –pi to pi, (iii) 0 to pi, (iv) –L to L, complex form of Fourierseries, Application of Fourier theorem for analysis of complex waves: solution oftriangular and rectangular waves , half and full wave rectifier outputs, Parseval identityfor Fourier Series, Fourier integrals.

UNIT III: Fourier transforms

Fourier transforms and its properties, Application of Fourier transform (i) for evaluationof integrals, (ii) for solution of ordinary differential equations, (iii) to the following
functions:
1. f(x)= e- x2/2
1 |X|<a
2 . f(x) =
0 |X |>a

Geometrical Optics I

Matrix methods in paraxial optics, effects of translation and refraction, derivation of thinlens and thick lens formulae, unit plane, nodal planes, system of thin lenses.

UNIT-IV: Geometrical Optics II

Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies.

Fiber Optics

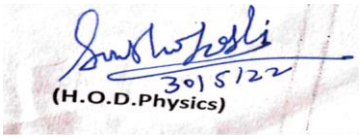
Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalizedfrequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication, Advantages.

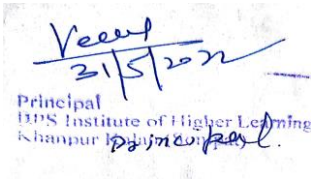
References

1 Born M and Wolf E, Principles of Optics, Pergaman Press
2 Jenkins and white, Fundamentals of Optics, McGraw Hill Book Co Ltd, New Delhi
3 Moller K D, Optics, University Science Books, Mill ally California
4 Tolansky, An Introduction to Interferometery, John Wiley & Sons, New Delhi
5 Shurcliff, Polarized Light Production and Use, Harward University Press, Cambridge, M A (USA)
6 Arora C L, Refresher Course in Physics Vol II, S Chand and Co, New Delhi.

Course learning outcomes

- Use the principles of wave motion and superposition to explain the Physics of Polarization.
- Phenomenon of double refraction, Huygen's wave theory of double refraction studied.
- Polarimeters are very useful in daily life.
- Learn the Fourier analysis of periodic functions and their applications in physical problems such as half wave and full wave rectifiers etc.
- Fourier transforms are used in many applications 1) for evaluation of integrals 2) for solutions of ordinary differential equations etc.
- Geometrical optics is very useful in daily life. For example in fiber optics communication.





B.Sc. II (Non Medical +Computer Science)

Semester-IV

Subject:Physics

Paper III

Practicals

Course Code: PHP-202 **Total Credits: 3** **L-T-P:3-0-0**

Total Marks:50

ExternalMarks:40(25+8+7)
(Experiment+copy+Viva Voice)
Internal Marks : 10(5+5) (Attendance+Seminar)

COURSE OBJECTIVE

- The main objective of this lab is to demonstrate the waves, type of waves and various phenomenon of optics.
- To study about the waves, superposition of waves, stationary waves, optical phenomenon based on superposition of waves such as Interference and Diffraction.
- To study about the Fortran programming of trapezoidal , quadratic equations.

Special Notes:-

1. Do any ten experiments
2. The students are required to calculate the error involved in a particular experiment

Experiments:-

1) To find out the resolving power of telescope.
2) To compare the illuminating power by photometer.
3) Measurement of a specific rotation and concentration of sugar solution using polarimeter.
4) Ordinary and extraordinary refractive indices of calcite and quartz.
5) To find the equivalent focal length of a lens system by nodal slide assembly.
6) To study the series and parallel resonance circuit.
7) To study the electronic voltmeter measurement of peak, average and R.M.S. value of signal.
8) To study the voltage doubler and trippler circuit.
9) To find the integration of definite integral by Trapezodial rule.
10) Given value of a,b,c and asset of values for variable x evaluate the function define by
    $F(x) = ax + bx + c$ if $x<d$

    $F(x) = 0$ if $x = d$

    $F(x) = ax + bx - c$ if $x>d$

11) For each value of x and print the value of x and f(x)
12) Write the program for arbitrary number of x values
13) To find out the roots of quadratic equations.
14) To study various characteristics of a transistor for common base and common emitter and calculate the transistor characteristics parameters.
15) To study the ripple factor in a DC power supply.
16) To find the frequency of given tuning fork by Melde's experiment.

17) To draw the frequency response cure of RC coupled amplifier.
18) Project work compulsory.
19) One day scientific tour compulsory.

Note:-

1. Practical examination will be held at the end of each semester.
2. Pass percentage is 40% and its necessary to pass in practical paper separately.
3. The students are required to calculate the error involved in a particular experiment.
4. Minimum ten experiments have to be done.
5. The practical examination will be held in 3 hours
6. Experiment Examination marks:-50

Distribution of marks:-

External Examination: 40 (Experiment+copy+Viva-Voice)25+8+7)

Internal Examination: 10(5+5) (Attendance+Seminar)

Total Marks: 50

7.For giving marks and lab record each college will maintain practical assessment record by using following procedure given below.

8.Each student has to perform a minimum number of experiment prescribed in the syllabus.

9. After completion of practical, the teacher concern will check the notebook and conduct viva-voice of each student to find out how much concepts related to the theoretical and experimental part of experiment she has understood. According to her performance marks will be recorded on their practical notebook. These markswill contribute the lab record.

10. To compute the final marks for lab record, a separate register will be maintained. Each student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be entered. his record
will be signed by concerned teacher.

11. One day scientific tour is compulsory.

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COURSE LEARNING OUTCOMES

- To understand about waves, its propagation and superposition of waves • To understand the basic concepts and principles of optics.
- To understand the nature of light.
- To understand basic optical phenomena such as interference, diffraction, the principles of lasers and their applications
- To handle the optical instruments and set-up basic optical experiments.
- To understand how to operates optical devices and equipment.
- Obtain the knowledge about the number systems this will be very useful for bitwise operations.
- Develop programs using the basic elements like control statements, Arrays and Strings
- Students will understand basics of numerical analysis.
- To write the various programs using Fortran language like integration of definite integral by Trapezodel rule, ordinary number of x values etc

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
BDS Institute of Higher Learning
Khanpur Kalan

B.Sc. III(Non Medical/Computer Science)
Semester – V
Subject: Quantum sand Laser Physics

Course code : PHY-301-B **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- Idea about Wave-particle duality, uncertainty principle, energy Schrodinger's equation, Applications of Schrodinger's equation (quantitative): The free particle, potential step, rectangular potential barrier and the tunnel effect free and bound states of a particle in square well potential, particle in a box (3D) problem.
- By the advent lasers, in twentieth century the laser physics now-a-days finds application in several branches of science and engineering.

Note:-

1. Nine Questions will be set in total
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but in Yes/ No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT I: Origin quantum physics (Experimental basis)

Overview, scale of quantum physics, boundary between classical and quantum phenomena, Photon, Photoelectric effect, Compton effect (theory and result), Frank- Hertz experiment, de-Broglie hypothesis. Davisson and Germer experiment, ·G.P.Thomson experiment. Phase velocity, group velocity and their relation. Heisenberg's uncertainty principle. Time energy and angular momentum, position uncertainty. Uncertainty principle from de Broglie wave. (Wave-particle duality). Gamma Ray Microscope, Electron diffraction from a slit. Derivation of 1-D time-dependent Schrodinger wave equation (subject to force, free particle). Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Orthogonality and Normalization of function, concept of observer and operator. Expectation values of dynamical quantities, probability current density.

UNIT II: Application of Schrodinger wave equation:

(i) Free particle in one-dimensional box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy).
(ii) One dimensional step potential E > Vo (Reflection and Transmission coefficient)
(iii) One dimensional step potential E < Vo (penetration depth calculation).
(iv) One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient)
(v) One-dimensional potential barrier, E < Vo (penetration or tunneling coefficient).
(vi) Solution of Schrodinger equation for harmonic oscillator (quantization of energy, Zero-point energy, wave equation for ground state and excited states).

UNIT III: Laser Physics –I

Absorption and emission of radiation, Main features of a laser: Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level, kinetics of optical absorption ((two and three level rate equation, Fuchbauer landerburg formula).population inversion: A necessary condition for light amplification, resonance cavity, laser pumping, Threshold condition for laser emission, line broadening mechanism, homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening).

UNIT IV: Laser Physics – II

He-Ne laser and RUBY laser (Principle, Construction and working), Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working), Applications of lasers in the field of medicine and industry.

References:

1 L I Schiff, Quantum Mechanics

2 Bransden B H and Joachain C J, Quantum Mechanics (2000), Pearson Education, New Delhi

3 Liboff R L, Introductory Quantum Mechanics

4 Eisberg R M and Resnick R, Quantum Physics of Atoms Molecules, Solids, Nuclei and Particles, Wiley Eastern Ltd, New Delhi

5 Verdeyen J T, Laser Electronics PHI, New Delhi

6 Thorenton S T and Rex A, Modern Physics, (2007) Cengage Learning, New Delhi

7 Taylor J R, Zafiratos C D and Dubson M A, Modern Physics, 2nd Ed (2004), PHI, New Delhi

8 Laud B B, Laser Physics

Course learning outcomes

- After an exposition of inadequacies of classical mechanics in explaining microscopic phenomena, quantum theory formulation is introduced through Schrodinger equation.
- Through understanding the behavior of quantum particle encountering a i) barrier, ii) potential, the student gets exposed to solving non-relativistic hydrogen atom, for its spectrum and eigenfunctions.
- Study of influence of electric and magnetic fields on atoms will help in understanding Stark effect and Zeeman Effect respectively.
- This basic course will form a firm basis to understand quantum many body problems.
- In This course the students would gain the knowledge basic principles, would study the various types of lasers, Laser spectroscopy and their applications in science and technology.
- Study different lasers He-Ne Laser, Ruby Laser and Semiconductor Laser.
- Study applications of laser in medicine and industry.

30/5/22
(H.O.D.Physics)

Assistant Professor

31/5/2022
Principal
DPS Institute of Higher Learning

B.Sc. II(Non Medical/Computer Science)
Semester – V
Subject: Physics
Paper: II
Nuclear Physics

Course code : PHY-301-B **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- Know the properties of nucleus likes binding energy, magnetic dipole moment and electric quadruple moment
- To understand the concept of radioactivity and decays law
- To study achievement of Nuclear Models of Physics and its limitations
- To give an extended knowledge about nuclear reactions such as nuclear fission and fusion.
- To understand the basics of hydrogen bomb etc.
- To understand, explain and derive the various theoretical formulation of nuclear disintegration like α decay, β decay and γ decays.
- Develop basic understanding of nuclear reactions and decays with help of theoretical formulate and laboratory experiments.
- Skills to develop basic understanding of the interaction of various nuclear radiation with matter in low and high energy

Note:-
1. Nine Questions will be set in total.
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit I: Nuclear Structure and Properties of Nuclei

Nuclear composition (p-e and p-n hypotheses), Nuclear properties; Nuclear size, spin, parity, statistics, magnetic dipole moment, quadruple moment (shape concept). Determination of mass by Bain-Bridge, Bain-Bridge and Jordan mass spectrograph. Determination of charge by Mosley Law. Determination of size of nuclei by Rutherford Back Scattering. mass and binding energy, systematic of nuclear binding energy, nuclear stability

Unit II: Nuclear Radiation decay Processes

Alpha-disintegration and its theory. Energetics of alpha-decay, Origin of continuous beta spectrum (neutrino hypothesis), types of beta-decay and energetics of beta-decay. Nature of gamma rays, Energetics of gamma rays.

Radiation interaction

Interaction of heavy charged particles (Alpha particles); Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Range and straggling of alpha particles. Geiger-Nuttal law. Interaction of light charged particle (Beta-particle), Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles. Interaction of Gamma Ray; Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect) electron-positron annihilation. Absorption of Gamma rays (Mass attenuation coefficient) and its application.

Unit III: Nuclear Accelerators

Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators.

Nuclear Radiation Detectors.

Gas filled counters; Ionization chamber, proportional counter, G.M. Counter (detailed study), Scintillation counter and semiconductor detector.

Unit IV:

Nuclear reactions.

Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions. Conservation laws, Q-

Nuclear Reactors.

Nuclear Reactors, General aspects of Reactor Design. Nuclear fission and fusion reactors, (Principle, construction, working and use).

References:

1 Kaplan I, Nuclear Physics, 2nd Ed (1962), Oxford and IBH, New Delhi
2 Sriram K, Nuclear Measurement Techniques, (1986), AEWP, New Delhi
3 Tayal D C, Nuclear Physics (1994), HPH, Bombay
4 Ghoshal S N, Atomic and Nuclear Physics Vol II (1994), S Chand & Co New Delhi
5 Srivastava B N, Basic Nuclear Physics, (1993), Pragati Prakashan Meerut
6 Halliday, Introductory Nuclear Physics, Asia Publishing House, New Delhi
7 Sood D D, Ready A V R and Ramamoorthy, Fundamentals of Radiochemistry, IANCAS (2007), BARC, Bombay
8 Cohen B L, Comcepts of Nuclear Physics (1998), Tata Mc Graw Hill, New Delhi
9 Krane K S, Introductory Nuclear Physics (1988), John Wiley & Sons New Delhi
10 Patel S B, Nuclear Physics (1992), Wiley Eastern Ltd, New Delhi
11 Roy R R and Nigam B P, Nuclear Physics (1993), Wiley Eastern Ltd New Delhi.

Course learning outcomes

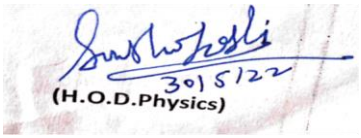
- To understand the basic concept of Particle Physics\Learn the ground state properties of a nucleus – the constituents and their properties, mass number and atomic number, relation between the mass number and the radius andthe mass number, average density, range of force, saturation property, stability curve, the concepts of packing fraction and binding energy, binding energy per nucleon vs.mass number graph, explanation of fusion and fission from the nature of the binding energy graph.
- Know about the nuclear models and their roles in explaining the ground state properties of the nucleus –(i) the liquid drop model, its justification so far as the nuclear properties are concerned, the semi-empirical mass formula, (ii) the shell model, evidence of shell structure, magic numbers, predictions of ground state spin and parity, theoretical deduction of the shell structure, consistency of the shell structure with the Pauli exclusion principles.
- Learn about the process of radioactivity, the radioactive decay law, the emission of alpha, beta and gamma rays, the properties of the constituents of these rays and the mechanisms of the emissions of these rays, outlines of Gamow's theory of alpha decay and Pauli's theory of beta

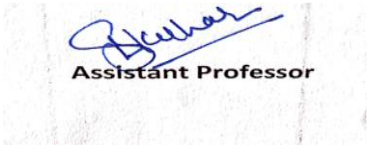
decay with the neutrino hypothesis, the electron capture, the fine structure of alpha particle spectrum, the Geiger-Nuttall law, the radioactive series.

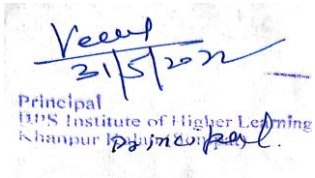
- Learn the basic aspects of nuclear reactions, the Q-value of such reaction and its derivation from conservation laws, The reaction cross-sections, the types of nuclear reactions, direct and compound nuclear reactions, Rutherford scattering by Coulomb potential.
- Learn some basic aspects of interaction of nuclear radiation with matter- interaction of gamma ray by photoelectric effect, Compton scattering and pair production, energy loss due to ionization, Cerenkov radiation.
- Learn about the detectors of nuclear radiations- the Geiger-Mueller counter, the scintillation counter, the photo-multiplier tube, the solid state and semiconductor detectors.

- The students are expected to learn about the principles and basic constructions of particle accelerators such as the Van-de-Graff generator, cyclotron, betatron and synchrotron. They should know about the accelerator facilities in India.
- Gain knowledge on the basic aspects of particle Physics – the fundamental interactions, elementary and composite particles, the classifications of particles: leptons, hadrons (baryons and mesons), quarks, gauge bosons. The students should know about the quantum numbers of particles: energy, linear momentum, angular momentum, isospin, electric charge, colour charge, strangeness, lepton numbers, baryon number and the conservation laws associated with them.

value and reaction threshold**.**







B.Sc. III (Non Medical +Computer Science)

Semester-V

Subject:Physics

Paper III

Practicals

Course Code: PHP-301 **Total Credits: 3 L-T-P 3-0-0**
Total Marks:50
External Marks:40(25+8+7)
(Experiment+copy+Viva Voice) ‘
Internal Marks : 10(5+5) (Attendance+Seminar)

Course learning objectives

- The students will gain practical knowledge of Fresnel’s by prism, double slit interferencemethod, B H curve by using oscilloscope and energy band gap of Ge/ Si by Four probe method.
- The student will solve numerical integration by Simpsons 1/3 method and product of two matrices by using DO LOOP methods and array’s variables.

Special Notes:-

1. Do any eight experiments
2. The students are required to calculate the error involved in a particular experiment.

Experiments:-

1) To find out the wavelength of sodium light by Fresnal byprism.
2) Determine the velocity of ultra sonic in kerosene oil.
3) To study the double state interference by He-Ne laser.
4) Determine the diameter of a wire using diffraction method.
5) Determine e/m by Thomson method.
6) To study the BH curve using CRO.
7) To measure the energy band gap by four probe method.
8) To write the various program using Fortran language like compute the product of two matrics.
9) To write the various program using Fortran language like numerical integration by simpson’s rule
10) To find out the fitting of straight line using least square method etc.
11) By using array variable find out the average and standard deviation.

Note:-

1. Practical examination will be held at the end of each semester.
2. Pass percentage is 40% and its necessary to pass in practical paper separately.
3. The students are required to calculate the error involved in a particular experiment.
4. Minimum ten experiments have to be done.

5. The practical examination will be held in 3 hours
6. Experiment Examination marks:-50

Distribution of marks:-

External Examination: 40 (Experiment+copy+Viva-Voice)(25+8+7)

Internal Examination: 10(5+5) (Attendance+Seminar)

Total Marks: 50

7.For giving marks and lab record each college will maintain practical assessment record by using following procedure given below.

8.Each student has to perform a minimum number of experiment prescribed in the syllabus.

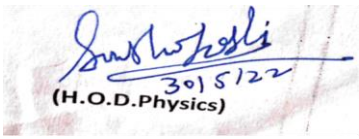
9. After completion of practical, the teacher concern will check the notebook and conduct viva-voice of each student to find out how much concepts related to the theoretical and experimental part of experiment she has understood. According to her performance marks will be recorded on their practical notebook. These marks will contribute the lab record.

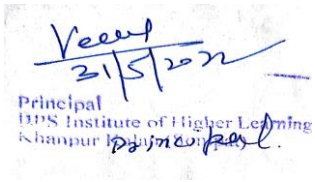
10. To compute the final marks for lab record, a separate register will be maintained. Each student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be entered. his record will be signed by concerned teacher.

11. One day scientific tour is compulsory.

COURSE LEARNING OUTCOMES

- Student will have practical experience in observing some of the important physical phenomena in physics such as quantization of charge and electron energy; nature of emission spectrum of hydrogen, sodium and mercury; and physical properties of laser beam. The students will gain practical knowledge in utilizing different types of Interferometers for various uses, practical handling of Lasers and their applications, study of GM characteristics.
- Students are expected to perform & learn computation of data by using different numerical methods.The students will be able to write their own Fortran program, compile and execute. They will also be exposed to practical implementation of numerical methods in programming.





B.Sc. II(Non Medical/Computer Science)
Semester – VI
Subject: Physics
Paper: I
Solid State and Nano Physics

Course code : PHY-302-A **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objective

- Learn basics of crystal structure and physics of lattice dynamics
- Learn the physics of different types of material like magnetic materials, dielectric materials, metals and their properties.
- Understand the physics of insulators, semiconductor and conductors with special emphasis on the elementary band theory of semiconductors.
- Comprehend the basic theory of superconductors. Type I and II superconductors, their properties and physical concept of BCS theory.
- Develop basic understanding of nanostructured materials.
- Learn the synthesis and characterization of nanostructured materials
- Study Nanotechnology and how Nanotechnology useful in medicine, transport, automobiles, electronics etc.

Note:-
1. Nine Questions will be set in total.
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. For more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

UNIT I: Crystal Structure I

Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.

UNIT II: Crystal Structure II

X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. K-space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.

UNIT III: Super conductivity

Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Pippards' equation, Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.

UNIT IV: Introduction to Nano Physics

Definition, Length scale, Importance of Nano-scale and technology, History of Nantechnology, Benefits and challenges in molecular manufacturing. Molecular assembler concept, Understanding advanced capabilities. Vision and objective of Nano-technology, Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology,Materials, Medicine.

References:

1 C. Kittel, Introduction to Solid State Physics, 7th Ed (1996) John Wiley & Sons, NewDelhi.
2 H. Ibach and H. Luth, Solid State Physics, An Introduction to Theory and Experiment, Springer-Verlag, Berlin, 1991
3 Pillai O S, Solid State Physics, New Age International Publishers (2007) New Delhi
4 Mark R and Denial R, Nano-tecnology – A Gentle Introduction to the Next Big Idea(2002)
5 M. Tinkham, Introduction to Superconductivity, McGraw-Hill, New York, 1975
6 Dekkar A J, Solid State Physics (2000), Mc Millan India Ltd New Delhi
7 Ascroft N W and Mermin N D, Solid State Physics (2003) Harcourt Asia, Singapore
8 Keer H V, Solid State Physics (1993), Wiley Eastern Ltd, New Delhi
9 Kachhava C M, Solid State Physics (1990) Tata Mc Graw Hill Co Ltd, New Delhi
10 Gupta, Solid State Physics (1995) Vikas Publishing House Pvt Ltd, New Delhi

Course learning outcomes

- At the end of the course the student is expected to learn and assimilate the following.A brief idea about crystalline and amorphous substances, about lattice, unit cell, miller indices, reciprocal lattice, concept of Brillouin zones and diffraction of X-rays by crystalline materials.
- Understanding above the band theory of solids and must be able to differentiate insulators, conductors and semiconductors.
- Understand the basic idea about superconductors and their classifications.
- Power applications of super conductors .
- Nanotechnology length scale studied,
- Nanotechnology have benefits in daily life in medicine, in biotechnology,security computers ,electronics devices etc.
- In the Nano systems and its implications in modifying the properties of materials at the nanoscale..
- Different synthesis techniques including top down and bottom up approaches.
- Characterization of nanostructured materials using X-ray diffraction, electron microscopy, Atomic Force Microscopy and Scanning Tunneling Microscopy. Optical properties of nanostructured materials, modification of band gap.
- Applications of nanostructured materials in making devices namely MEMS, NEMS and other heterostructures for solar cell and LEDs
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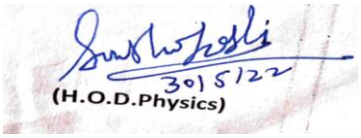

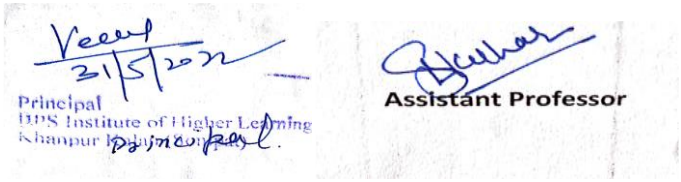

B.Sc. II(Non Medical/Computer Science)
Semester – VI
Subject: Physics
Paper: II Atomic and Molecular Spectroscopy

Course code : PHY-302-B **Total Credits :3 L-T-P:3-0-0**
Total Marks-50

External Marks:40
Internal Marks : 10 (Sessional/Project) **Max. Time: 3 hours**

Course Objectives: Objective of this course is to learn atomic, molecular and spin resonance spectroscopy i.e. One Electron Atom , Two valance Electron Atom:,Atom in Magnetic Field& Molecular Spectroscopy

Note:-

1. Nine Questions will be set in total
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. For more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit – I: Historical background of atomic spectroscopy

Introduction of early observations, emission and absorption spectra, atomic spectra, wave number, spectrum of Hydrogen atom in Balmer series, Bohr atomic model(Bohr's postulates)
spectra of Hydrogen atom , explanation of spectral series in Hydrogen atom, un-quantized states and continuous spectra, spectral series in absorption spectra, effect of nuclear motion on line spectra (correction of finite nuclear mass), variation in Rydberg constant due to finite mass, short comings of Bohr's theory, Wilson sommerfeld quantization rule, de-Broglie interpretation of Bohr quantization law, Bohr's corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld theory, Vector atom model**;** space quantization, electron spin, coupling of orbital and spin angular momentum, spectroscopic terms and their notation, quantum numbers associated with vector atom model, transition probability and selection rules.

Unit –II: Vector Atom Model (single valance electron)

Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic filed; Larmors' precession and theorem. Penetrating and Non-penetrating orbits, Penetrating orbits on the classical model**;** Quantum defect, spin orbit interaction energy of the single valance electron, spin orbit interaction for penetrating and non-penetrating orbits. quantum mechanical relativity correction, Hydrogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, Rydeburg-Ritze combination principle, Absorption spectra of Alkali atoms. observed doublet fine structure in the spectra of alkali metals and its Interpretation, Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum .

UNIT-III: Vector Atom model (two valance electrons)

Essential features of spectra of Alkaline-earth elements, Vector model for two valance electron atom: application of spectra. Coupling Schemes;LS or Russell – Saunders Coupling Scheme and JJ coupling scheme, Interaction energy in L-S coupling (sp, pd configuration), Lande interval rule, Pauli principal and periodic classification of the elements. Interaction energy in JJ Coupling (sp, pd configuration), equivalent and non-equivalent electrons, Two valance electron system-spectral terms of non-equivalent and equivalent electrons, comparison of spectral terms in L-S And J-J coupling. Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin.

Unit –IV**: Atom in External Field**

Zeeman Effect (normal and Anomalous),Experimental set-up for studying Zeeman effect, Explanation of normal Zeeman effect(classical and quantum mechanical), Explanation of anomalous Zeeman effect(Lande g-factor), Zeeman pattern of D1 and D2 lines of Na atom, Paschen-Back effect of a single valence electron system. Weak field Stark effect of Hydrogen atom.

Molecular Physics

General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region), Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra.

References

1 Beiser A, Concept of Modern Physics (1987), Mc Graw Hill Co Ltd, New Delhi
2 Rajab J B, Atomic Physics (2007), S Chand & Co, New Delhi
3 Fewkes J H and Yarwood J Atomic Physics Vol II (1991) Oxford University Press
4 Bransden B H and Joachain C J, Physics of Atoms and Molecules 2nd Ed (2009), Pearson Education, New Delhi.
5 Banwell, Molecular Spectroscopy
6 Ghoshal S N, Atomic and Nuclear Physics Vol I (1996) S Chand & Co, New Delhi
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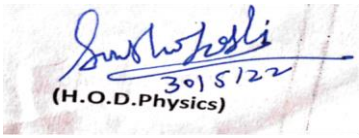
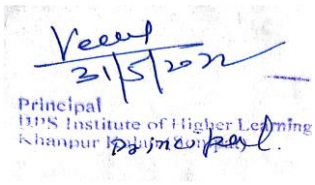
8 Raj Kumar, Atomic and Moleculer Spectra:Laser , Kedarnath Ram nathpub.
9 S.L.Gupta, V.Kumar,R.C.Sharma, Elements of Spectroscopy,Pragati Prakashan.

Course learning outcomes

- Describe the atomic spectra of one and two valance electron atoms.
- Explain the change in behavior of atoms in external applied electric and magnetic field.
- Explain rotational, vibrational, electronic and Raman spectra of molecules.
- Describe electron spin and nuclear magnetic resonance spectroscopy and their applications
- To know the Rutherford Experiment of atom.
- To understand molecular spectra of atom..
- . To study the Zeeman Effect and Paschen back Effect.
- To understand the Quantum Number.





B.Sc. III (Non Medical +Computer Science)

Semester-VI

Subject:Physics

Paper III

Practicals

Course Code: PHP-302 **Total Credits: 3 L-T-P 3-0-0**

Total Marks:50

External Marks:40(25+8+7)
(Experiment+copy+Viva Voice)
Internal Marks : 10(5+5) (Attendance+Seminar)

COURSE OBJECTIVE

- To provide the student with the ability to understand the duality in nature and to develop analytical ability of inference drawing.The students will understand basic ideas in Photonics, nature of light, energy bands in solids, absorption and emission spectra, luminescence and types, basic working principle and characteristics of light detectors.
- The students will be able to write their own Fortran program, compile and execute. They will also be exposed to practical implementation of numerical methods in programming..

Special Notes:-

1. Do any eight experiments
2. The students are required to calculate the error involved in a particular experiment.

Experiments:-

1) To find out the thickness of paper using interference fringes in an air wedge.
2) To determine the resolving power of a prism.
3) Determine the resolving power of transmission grating.
4) Determine the R_H by grating an hydrogen tube.
5) To study the common base transistor amplifier.
6) To study the common emitter transistor amplifier.
7) To draw the plateau by using GM counter.
8) To determine the mass attenuation coefficient by using GM counter.
9) To study the Hall effect.
10) To study the Hartley oscillator.
11) Compute the sum of finite series upto correct three decimal places.
12) With the help of program arrange the marks in ascending and descending order.

Note:-

1. Practical examination will be held at the end of each semester.
2. Pass percentage is 40% and its necessary to pass in practical paper separately.
3. The students are required to calculate the error involved in a particular experiment.
4. Minimum ten experiments have to be done.

5. The practical examination will be held in 3 hours
6. Experiment Examination marks:-50

Distribution of marks:-

External Examination: 40 (Experiment+copy+Viva-Voice)(25+8+7)

Internal Examination: 10(5+5) (Attendance+Seminar)

Total Marks: 50

7.For giving marks and lab record each college will maintain practical assessment record by using following procedure given below.

8.Each student has to perform a minimum number of experiment prescribed in the syllabus.

9. After completion of practical, the teacher concern will check the notebook and conduct viva-voice of each student to find out how much concepts related to the theoretical and experimental part of experiment she has understood. According to her performance marks will be recorded on their practical notebook. These markswill contribute the lab record.

10. To compute the final marks for lab record, a separate register will be maintained. Each student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be entered. his record will be signed by concerned teacher.

11. One day scientific tour is compulsory.

COURSE LEARNING OUTCOMES

- Student will have practical experience in observing some of the important physical phenomena in physics such as quantization of charge and electron energy; nature of emission spectrum of hydrogen, sodium and mercury; and physical properties of laser beam. The students will gain practical knowledge in utilizing different types of Interferometers for various uses, practical handling of Lasers and their applications, study of GM characteristics.
- Students are expected to perform & learn computation of data by using different numerical methods.The students will be able to write their own Fortran program, compile and execute. They will also be exposed to practical implementation of numerical methods in programming.