



RIMT
UNIVERSITY

Program: Bachelor of Science Non Medical
Program Code: NMED H 301

Study Scheme & Syllabus (Choice Based Credit System)

For

B.Sc. Non Medical

1st TO 6th SEMESTER

(w.e.f. Session 2017-18)

Program Code: NMED H 301



DEPARTMENT OF PHYSICS

SCHOOL OF BASIC AND APPLIED SCIENCES

RIMT UNIVERSITY, MANDIGOBINDGARH, PUNJAB



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SECTION 1

Vision & Mission of the University

Vision:

To become one of the most preferred learning places a centre of excellence to promote and nurture future leaders who would facilitate in desired change in the society

Mission:

- To impart teaching and learning through cutting edge technologies supported by the world class infrastructure
- To empower and transform young minds into capable leaders and responsible citizens of India instilled with high ethical and moral values

SECTION 2

Vision & Mission of the Department

Vision:

To build a foundation for Excellence and encourage the development of the institution as premier institution by igniting and promoting enthusiasm, interest and passion, in the study of physics in professional courses as a part of curriculum.

Mission:

- To awaken the young minds and discover their talents both in theory and practical physics through dedication to teach, commitment towards students and the responsibility towards the department.
- To support the development activities of the university and make the department vibrant.
- To demonstrate a high level of competence in the study of applied physics.
- To develop strategy in the department for continuous improvement.
- Department of Physics achieves its mission by trying to evenly represent the underlying sub- disciplines of physics in research and teaching, but also to promote new areas of research, with an emphasis on interdisciplinary and applied research.

SECTION 3

About the Program

Our B.Sc. Non Medical Program is an Outcome Based Education model which is a 3 year, 6 Semester Full time Program of 139* credit hours with a Choice Based Credit System (CBCS) and Grading Evaluation System. This program comprises of foundational courses, core courses, specialization electives courses and experimental learning. The suggestive curriculum takes the B.Sc. Non Medical program to the next level in terms of implementing Outcome Based Education and to develop management professionals who are knowledgeable in their chosen domain, responsive to the environment and culture, unflinching to the communities, ethical in all doings and with a global outlook and approach. These objectives shall be achieved through a very rigorous academic processes, updated and relevant curriculum, extensive industry interaction and collaborations, sports and vibrant student activities.

OBJECTIVES

The objectives of the B.Sc. Non Medical programme are:

1. To motivate and inspire the students to create deep interest in Physics, chemistry and mathematics.
2. To develop broad and balanced knowledge and understanding of physical concepts, principles and theories of Physics.
3. Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.



SECTION 4

Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs)

PROGRAM EDUCATION OBJECTIVES

PEO1	To develop the ability to apply the acquired knowledge of Physics to specific real-life problems.
PEO2	To develop broad and balanced knowledge with understanding of physical concepts, principles and theories of Physics.
PEO3	To develop the confidence of graduates to appear for SSC, IBPS, RRB and Civil services exam and to occupy higher posts at administrative level
PEO4	To emphasize the discipline of Physics to be the most important branch of science for pursuing the interdisciplinary and multidisciplinary higher education/research.
PEO5	To make the students technically and analytically skilled

PROGRAMME OUTCOMES (POs)

PO 1	Acquired the knowledge with facts and figures related to various subjects in pure sciences such as Physics, Chemistry, Mathematics, Biosciences, etc.
PO 2	Realized how interdisciplinary approach helps in providing better solutions and ideas for the sustainable development.
PO 3	Been able to think creatively in explaining facts and figures or providing solutions to the problems
PO 4	Attained the skills of observations and drawing logical inferences from the scientific experiments.



PO 5	Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments.
PO 6	Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena.
PO 7	Learnt the art of teaching and acquired the ability to deal with the students based on their individual differences in various classroom situations

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	To enable the students to acquire and use the competencies and skills needed for becoming a competent, committed and effective Physics teacher through innovative teaching methods.
PSO 2	To inculcate rational thinking and scientific temper among the students.



SECTION 5

Curriculum / Scheme with Examination Grading Scheme

INDUCTION PROGRAM

Induction Program (Mandatory)	
Duration	03 weeks
Frequency	Induction program for students to be offered right at the start of the first year
Activities	<ul style="list-style-type: none"> • Physical Activity • Sports, Yoga & Stress Management • Creative Arts • Universal Human Values • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

**SEMESTER WISE SUMMARY OF THE PROGRAMME: B.Sc. (H)
PHYSICS**

S. No.	Semester	No. of Contact Hours	Marks	Credits
1.	I	30	900	25
2.	II	28	800	24
3.	III	27	700	23
4.	IV	27	800	23
5.	V	26	800	22
6.	VI	26	800	22
	Total	162	4800	139



COURSE CATEGORY-WISE CREDIT DISTRIBUTION

S. No.	Category	Number of Credits	Percentage Weightage
1	University Core	3	2.24
2	University Open	2	1.49
3	Program Core	134	100
4	Program Elective		
5	Program Specialization		
6	MOOCs		
7	Project / Research Projects		
8	Thesis/Dissertation		
9	Training/Internships/Field Trips		
10	Professional Skills		
11	Any Other(Fundamental)		
TOTAL CREDITS			

EXAMINATION GRADING SCHEME

Marks Percentage Range	Grade	Grade Point	Qualitative Meaning
80.00 - 100.00	O	10	OUTSTANDING
70.00 - 79.99	A+	9	EXCELLENT
60.00 - 69.99	A	8	VERY GOOD
55.00 - 59.99	B+	7	GOOD
50.00 - 54.99	B	6	ABOVE AVERAGE



45.00 - 49.99	C	5	AVERAGE
40.00 - 44.99	P	4	PASS
0.00 - 39.99	E	0	FAIL
ABSENT	AB	0	Absent

Percentage Calculation: CGPA *10

First Semester:

COURSE		Contact Hours/Week			Credit	% of Total Marks					Exam Duration (Hours)
Code	Course Title	L	T	P		CWA	LWA	MTE	ETE	Total	
BPHY-1121	Mechanics	4	0	0	4	16	-	24	60	100	3
BPHY-1122	Physics Lab-I	0	0	4	2	-	60	-	40	100	3
BMAT-1121	Calculus-1	3	1	0	4	16	-	24	60	100	3
BMAT-1122	Algebra	3	1	0	4	16	-	24	60	100	3
BHUM-1101	Communication Skills	2	0	0	2	16	-	24	60	100	3
BHUM-1102	Communication Skills Lab	0	0	2	1	-	60	-	40	100	3
BCHE-1123	Organic Chemistry-I	2	0	0	2	16	-	24	60	100	3
BCHE-1124	Physical Chemistry-I	4	0	0	4	16	-	24	60	100	3
BCHE-1125	Chemistry Lab-I	0	0	4	2	-	60	-	40	100	3
Total		18	2	10	25						

Second Semester

COURSE		Contact Hours/Week			Credit	% of Total Marks					Exam Duration (Hours)
Code	Course Title	L	T	P		CWA	LWA	MTE	ETE	Total	
BPHY-1221	Electricity & Magnetism	4	0	0	4	16	-	24	60	100	3



BPHY-1222	Physics Lab-II	0	0	4	2	-	60	-	40	100	3
BMAT-1221	Calculus-II	3	1	0	4	16	-	24	60	100	3
BMAT-1222	Modern Algebra	3	1	0	4	16	-	24	60	100	3
BEVS-1201	Environmental Studies	2	0	0	2	16	-	24	60	100	3
BCHE-1223	Organic Chemistry-II	2	0	0	2	16	-	24	60	100	3
BCHE-1224	Inorganic-Chemistry-I	4	0	0	4	16	-	24	60	100	3
BCHE-1225	Chemistry Lab-II	0	0	4	2	-	60	-	40	100	3
Total		18	2	8	24						

Third Semester

COURSE		Contact Hours/Week			Credit	% of Total Marks					Exam Duration (Hours)
Code	Course Title	L	T	P		CWA	LWA	MTE	ETE	Total	
BPHY-2321	Statistical Physics & Thermodynamics	4	0	0	4	16	-	24	60	100	3
BPHY-2322	Vibration & Waves	3	0	0	3	16	-	24	60	100	3
BPHY-2323	Physics Lab-III	0	0	4	2	-	60	-	40	100	3
BMAT-2321	Linear Algebra	3	0	0	3	16	-	24	60	100	3
BMAT-2322	Differential Equations	3	0	0	3	16	-	24	60	100	3
BCHE-2324	Organic Chemistry-III	2	0	0	2	16	-	24	60	100	3
BCHE-2325	Physical Chemistry-II	4	0	0	4						
BCHE-2326	Chemistry Lab-III	0	0	4	2	-	60	-	40	100	3
Total		19	0	8	23						

Fourth Semester

COURSE		Contact Hours/Week			Credit	% of Total Marks					Exam Duration (Hours)
Code	Course Title	L	T	P		CWA	LWA	MTE	ETE	Total	
BPHY-2421	Quantum Mechanics	4	0	0	4	16	-	24	60	100	3
BPHY-2422	Optics & Laser	3	0	0	3	16	-	24	60	100	3



BPHY-2423	Physics Lab-IV	0	0	4	2	-	60	-	40	100	3
BMAT-2421	Vector Analysis	3	0	0	3	16	-	24	60	100	3
BMAT-2422	Discrete Mathematics	3	0	0	3	16	-	24	60	100	3
BCHE-2424	Organic Chemistry-IV	2	0	0	2	16	-	24	60	100	3
BCHE-2425	Inorganic-Chemistry-II	4	0	0	4	16	-	24	60	100	3
BCHE-2426	Chemistry Lab-IV	0	0	4	2	-	60	-	40	100	3
Total		19	0	8	23						

Fifth Semester

COURSE		Contact Hours/Week			Credit	% of Total Marks					Exam Duration (Hours)
Code	Course Title	L	T	P		CWA	LWA	MTE	ETE	Total	
BPHY-3521	Atomic & Molecular Spectra	3	0	0	3	16	-	24	60	100	3
BPHY-3522	Solid State Physics	3	0	0	3	16	-	24	60	100	3
BPHY-3523	Physics Lab-V	0	0	4	2	-	60	-	40	100	3
BMAT-3521	Statics	3	0	0	3	16	-	24	60	100	3
BMAT-3522	Calculus of Variations	3	0	0	3	16	-	24	60	100	3
BCHE-3524	Organic Chemistry-V	2	0	0	2	16	-	24	60	100	3
BCHE-3525	Physical Chemistry-III	4	0	0	4	16	-	24	60	100	3
BCHE-3526	Chemistry Lab-V	0	0	4	2	-	60	-	40	100	3
Total		18	0	8	22						

Sixth Semester

COURSE		Contact Hours/Week			Credit	% of Total Marks					Exam Duration (Hours)
Code	Course Title	L	T	P		CWA	LWA	MTE	ETE	Total	



BPHY-3621	Nuclear & Particle Physics	4	0	0	4	16	-	24	60	100	3
BPHY-3622	Electronics	2	0	0	2	16	-	24	60	100	3
BPHY-3623	Physics Lab-VI	0	0	4	2	-	60	-	40	100	3
BMAT-3621	Dynamics	3	0	0	3	16	-	24	60	100	3
BMAT-3622	Numerical Methods	3	0	0	3	16	-	24	60	100	3
BCHE-3624	Organic Chemistry-VI	2	0	0	2	16	-	24	60	100	3
BCHE-3625	Inorganic Chemistry-III	4	0	0	4	16	-	24	60	100	3
BCHE-3626	Chemistry Lab-VI	0	0	4	2	-	60	-	40	100	3
Total		18	0	8	22						

CWA **Class Work Assessment**

LWA **Lab Work Assessment**

MTE **Mid Term Exam**

ETE **End Term Exam**

NC **No Credit**

EVALUATION

1. There shall be two Mid Term Examination (MTE) of 24% Marks (24 marks) in each semester. Average of two is considered for final internal assessment.
2. There shall be continuous class work assessment (CWA) of 16% (16 Marks) of theory subjects
3. End Term examination (ETE) will be of 60% of total marks (60 marks).
4. Each practical examination shall be of 3 hours duration.
5. There shall be continuous lab work assessment (LWA) for practical of 60% marks (60 marks). The final examination will be of 40% marks (40 marks).

Pattern of Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.



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SECTION 6

Detailed Syllabus with Course Outcomes



SYLLABUS

SEMESTER-I

SUBJECT TITLE: MECHANICS (BPHY-1121)

SUBJECT CODE: BPHY-1121

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of Course: The purpose of the course is to train the students in the Newtonian Mechanics and Special Theory of Relativity formalisms to an extent that they can use these in the modern branches of Physics.

Outcome of Course:

1. To train the students in the Newtonian Mechanics and Special Theory of Relativity formalisms to an extent that they can use these in the modern branches of Physics.
2. Understand the vector algebra and Cartesian and spherical polar co-ordinate systems
3. Learn about Elastic collision in Lab and C.M system and various other parameters
4. To study frame of reference, Inertial frame of reference and special theory of relativity.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Vector algebra, Scalar and vector products, Derivatives of a vector with respect to a parameter, Cartesian and spherical polar co-ordinate systems, area, volume, velocity and Acceleration in these systems, Solid angle, Relationship of conservation laws and symmetries of space and time. Centre of Mass, equivalent one body problem, central forces, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), equation of orbit & turning points, Kepler's Laws, Satellite in circular orbit and applications, Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS).	15
UNIT-II	Elastic collision in Lab and C.M system, velocities, angles and energies in these system, cross-section of elastic scattering, Rutherford scattering, Rotational motion: Angular velocity and angular momentum, Torque,	15



	Conservation of angular momentum, principal moments and Axes, Euler's equations, precession and elementary gyroscope.	
UNIT-III	Frame of reference, Inertial frame of reference, Galilean transformation and Invariance, Non Inertial frames, coriolis force and its applications, Variation of acceleration due to gravity with latitude, Foucault pendulum. Special Theory of Relativity: Concept of Ether and Michelson–Morley experiment, Constancy of speed of light, Postulates of Special Theory of Relativity, Lorentz transformations, Length contraction, Time dilation, Relativistic addition of velocities, Relativistic Doppler effect, Variation of Mass with velocity, Mass-energy relation, Relativistic momentum & energy, Transformation of momentum and energy, Concept of Minkowski space	15
UNIT-IV	Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion ,Torsional pendulum, Determination of Rigidity modulus and moment of inertia - q , η and V by Searles method.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-1121.1	To train the students in the scalar and vector applications centre of mass formalisms to an extent that they can use these in the modern branches of Physics.
CO2	BPHY -1121.2	Learn about Elastic collision in Lab and C.M system and various other parameters.
CO3	BPHY -1121.3	To study frame of reference, Inertial frame of reference and special theory of relativity.
CO4	BPHY -1121.4	To study mechanical properties-structure correlations of materials to study their real life applications.

Books Recommended:

1. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al., Tata McGraw-Hill, 2007
2. Physics, Resnick, Halliday and Walker, John Wiley, 2008
3. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
4. The Special Theory of Relativity, S. Banerji & A. Banerji, Prentice Hall India, 2012

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

SUBJECT TITLE:PHYSICS LAB-I

SUBJECT CODE: BPHY-1122
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam: 3 Hrs

Objective of course: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note: Students will be required to perform at least 10 experiments from the given list of experiments:

1. Measurements of length (or diameter) using vernier caliper, screw gauge and Travelling microscope.
2. To study the random error in observations.
3. To determine the height of a building using a Sextant.
4. To study the Motion of Spring and calculate (a) spring constant, (b) g and (c) Modulus of rigidity.
5. To determine the Moment of Inertia of a Flywheel.
6. To establish relationship between torque and angular acceleration using flywheel.
7. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
8. To determine the Young Modulus of a Wire by bending of beam Method
9. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
10. To determine the elastic Constants of a wire by Searle's method.
11. To determine the value of g using Bar Pendulum.
12. To determine the value of g using Kater's Pendulum.

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-1122.1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO2	BPHY-1122.2	Demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.

Books Recommended:

1. A Text Book of Practical Physics, I.Prakash& Ramakrishna, KitabMahal, 2011
2. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010

SUBJECT TITLE: CACULUS-I



SUBJECT CODE: BMAT-1121

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective:

The objective of this course is to introduce the fundamental ideas of the differential and integral calculus of functions of one variable. Limits and continuity, Integrals, Fundamental Theorem, Techniques of Integration, Definite integrals.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Real number system and its properties, lub, glb of sets of real numbers, Functions, limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Uniform continuities	10
UNIT-II	Differentiation of hyperbolic functions, Successive differentiation, Leibnitz theorem and its applications, Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms Functions	10
UNIT-III	Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin^n x \, dx$, $\int \cos^n x \, dx$, $\int \tan^n x \, dx$, $\int \sec^n x \, dx$, $\int (\log x)^n \, dx$, $\int \sin^n x \cos^m x \, dx$ and its other application for different examples. Convexity and Concavity, Asymptotes, Curve tracing: Tracing of Standard Cartesian; Parametric and Polar curves; Curvature of Cartesian, Parametric and Polar curves.	15
UNIT-IV	Rectification of standard curves; Areas bounded by standard curves; Volumes and surfaces of revolution of curves; Applications of integral calculus to find centre of gravity and moment of inertia	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT-1121.1	Students are expected to be able to evaluate various limit problems both algebraically and graphically
CO2	BMAT-1121.2	After completing the course, students would be able to evaluate limits with indeterminate forms using L' Hospital rule



CO3	BMAT-1121.3	To Check the continuity of various types of functions
CO4	BMAT-1121.4	To Understand the consequence of the intermediate value theorem for continuous functions

Recommended Books:

1. Thomes, G.B, Finney, R.L. Calculus and Analytic Geometry, 6th Edition, 1998, Narosa Publication.
2. N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow.

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A , B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

SUBJECT TITLE: Algebra I
SUBJECT CODE: BMAT-1122
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective:

This course will enhance ability of research, inquiry and analytical thinking in mathematical Problems and better understanding of De-Moivre's theorem and its applications, Transformation of equation and rank of a matrix.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	De-Moivre's Theorem and its applications. Real and Imaginary parts of Exponential, logarithmic, circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables. Summation of Trigonometric series, (C+iS method).	15
UNIT-II	Relations between Roots and Coefficients of a general Polynomial, Transformation of equation. Descartes' rule of signs, Solution of cubic	10



	equations, Bi- quadratic equations and their solution.	
UNIT-III	Rank of a matrix, Elementary transformations, Linear independence and dependence of vectors, Gauss-Jordan method to find inverse of a matrix, reduction to normal form, Consistency and solution of linear algebraic equations	10
UNIT-IV	Linear transformations, Orthogonal transformations, Eigen values, Eigen vectors, Cayley-Hamilton Theorem, Reduction to diagonal form, orthogonal, unitary, Hermitian and similar matrices.	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT-1122.1	Students will be able to find the inverse of a square matrix.
CO2	BMAT-1122.2	After completing the course, students would be able to solve the matrix equation $Ax = b$ using row operations and matrix operations.
CO3	BMAT-1122.3	Students are expected to be able to find the determinant of a product of square matrices, of the transpose of a square matrix, and of the inverse of an invertible matrix
CO4	BMAT-1122.4	To understand the method of finding characteristic equation, Eigen values and corresponding eigenvectors of a given matrix.

Recommended Books:

1. Linear Algebra by Schamoutline Series.
2. Trigonometry by S.L. Loney, Arihant, 2011.
3. Text Book on Algebra and theory of Equations by Dr.Chandrika Prasad, Pothushala Pub. 2011
4. A basic course in Abstract Algebra, R. K. Sharma, S. K. Shah and AshaGauri Sharma,2011.

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A , B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

COURSE TITLE: COMMUNICATION SKILLS

SUBJECT CODE: BHUM-1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective:



The purpose of the course is to train the students to express their views freely and have fluency in the language.

Sr.No	Contents	Contact Hours
UNIT I	Comprehension exercises on the following selective readings: <ul style="list-style-type: none"> • The Voice of God • The Portrait of a Lady • Kabuliwala • A Service of Love • Green Parrots in A Cage 	7
UNIT II	Communication: Introduction, Meaning, Definition, Elements, Process of communication, Features/Characteristics of communication, Types of communication, Principles/Essentials of Effective communication, Importance of communication	5
UNIT III	Listening Skills- Introduction, Difference between Listening and Hearing, Essential skills for listening, Barriers to listening, Tips for improving Listening skills Personality Development: Introduction, Meaning, Definitions of Personality, Determinants of Human Personality, Traits of an effective Personality, Steps for Personality Development, Self Esteem	8
UNIT IV	Vocabulary and Grammar: Parts of Speech, Tenses, One word substitution, Antonyms, Prefixes and Suffixes, Punctuation, Letter Writing(Personal), Essay Writing, Comprehension(Unseen Passage)	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BHUM-1101.1	understand and apply knowledge of human communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication, etc. from multiple perspectives.
CO2	BHUM-1101.2	Write effectively for a variety of contexts and audience
CO3	BHUM-1101.3	Engage in scholarly inquiry and social scientific research
CO4	BHUM-1101.4	Recognize the effects of diversity, access, and power on communication

PRESCRIBED BOOK

- Prose Parables by Orient Blackswan (For Unit I)

RECOMMENDED BOOKS:

1. Fluency in English- Part II, Oxford University, 2006
2. Business English, Pearson, 2008
3. Language, Literature and Creativity, Orient Blackswan, 2013
4. Language through Literature(forthcoming) ed. Dr. Gauri Mishra, DrRanjanaKaul, DrBrati Biswas 2016
5. English for Effective Communication by Navjot S.Deol 2007.
7. An Approach to Communication Skills by Indrajit Bhattacharya 2012.
8. Business Communication by Varinder Kumar and Bodh Raj 2001.
9. Personality Development and soft Skills by Achhru Singh and Dharminder Singh Ubha 2004.

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

SUBJECT TITLE: ORGANIC CHEMISTRY-I
SUBJECT CODE: BCHE-1123
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective of course: To impart knowledge of basics of organic chemistry & Stereochemistry of organic compounds.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Basics of organic chemistry: Hybridization, shapes of molecules, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding(applications of all these effects);organic acids & bases, and their relative strengths; dipole moment.	5
UNIT-II	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.Nucleophilicity& basicity; Types of organic reactions & their mechanisms, Energy considerations. Reactive intermediates-carbocations, carbanions, free radicals, carbenes, and nitrenes (their types, shapes & relative stability). Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).	5
UNIT-III	Stereochemistry-I: Concept of isomerism.Types of isomerism. Optical isomerism -	10



	elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, specific rotation, properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythrodiastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.	
UNIT-IV	Geometric isomerism - determination of configuration of geometric isomers. Syn-anti & E & Z notations with C.I.P. rules, geometric isomerism in oximes and alicyclic compounds. Optical isomerism, Conformational isomerism - conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives. Difference between conformation and configuration, Fischer and flying wedge formulae Newman projection and Sawhorse formulae & their interconversion.	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-1123.1	Know and recall the fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.
CO2	BCHE-1123.2	Name the functional groups and different class of organic compounds.
CO3	BCHE-1123.3	Recognize the basic practical skills for the synthesis and analysis of organic compounds
CO4	BCHE-1123.4	Know and recall the fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.

Books Recommended:

1. Robert Thornton Morrison and Robert Neilson Boyd, Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. I.L. Organic Chemistry (Volume I), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. I.L. Finar, Organic Chemistry (Volume II): Stereochemistry & the chemistry of natural products, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

SUBJECT TITLE: PHYSICAL CHEMISTRY-I

SUBJECT CODE: BCHE-1124

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4



Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective of course:To impart knowledge of basics of physical chemistry.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	<p>Mathematical Concepts: Logarithmic relations, differentiation of functions like Kx, e^x, x^n, $\sin x$, $\log x$, maxima and minima, partial differentiation and reciprocity relations. Integration of some useful relevant functions.</p> <p>Liquid State: Intermolecular forces, differences between solids, liquids and gases states, Physical properties of liquid-vapour pressure, surface tension, surface active agents, viscosity, effects of temperature on viscosity, Liquid crystals: Difference between liquid crystal, LCDs & the seven segment cell, Classification of thermotropic, liquid crystal, smectic liquid crystal, nematic liquid crystals, cholesteric liquid crystal, disc shaped liquid crystals, polymer liquid crystals.</p>	15
UNIT-II	<p>Gaseous State:The kinetic molecular theory of gases, deviation from ideal behaviour, van der Waals equation of states, kinetic energy & temperature, Maxwell distribution of molecular velocities & energies, types of molecular velocities, collision parameters (diameter, cross section, number frequency), mean free path, the critical phenomena P-V isotherm of CO_2, the vander Waal's equation of critical state, principal of corresponding states, reduced equation of state, molar masses & density of real gases, liquefaction of gases, viscosity, diffusion.</p> <p>Chemical Equilibrium: Irreversible & reversible reactions, chemical equilibrium, law of mass action, thermodynamic treatment of law of mass action, Van't Hoff reaction isotherm, relation between K_p, K_c & K_x, homogenous & heterogenous equilibria, Le Chatelier's principle, applications of Le Chatelier's principle, Clausius-Clapeyron equation.</p>	15
UNIT-III	<p>Chemical Kinetics-I</p> <p>Rate of a reaction, rate law & rate constant, factors influencing the rate of a reaction, Units of rate constant, integration of rate expressions, order & molecularity of reactions, zero order, first order, second order & third order reactions, pseudo order reactions, half life time of a reaction, methods of determining order of a reaction, Radioactive decay as a first order phenomenon, kinetics of complex reactions: opposing, consecutive & chain reactions.</p>	7
UNIT-IV	<p>Chemical Kinetics-II</p> <p>Eyring equation, Lindemann theory unimolecular gaseous reactions, effect of temperature & pressure on reaction rate, theories of reaction rates. Catalysis Introduction, Homogeneous & heterogenous catalysis, enzyme catalysis, kinetics of enzyme catalyzed reaction- Michaelis-Menten equation.</p>	8

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-1124.1	Know and recall the fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.
CO2	BCHE-1124.2	To describe the characteristic of the three states of matter.
CO3	BCHE-1124.3	To describe the different physical properties of each state of matter.
CO4	BCHE-1124.4	To determine the difference between solids, liquids and gases.

Books Recommended:

1. Physical Chemistry by Gurdeep Raj; Krishna Prakashan Media (P) Ltd.
2. Physical Chemistry by Puri Sharma Pathania; Vishal Publishing Co.
3. Physical Chemistry by Atkins; W.H. Freeman & Company, New York.
4. Advanced Physical Chemistry by Gurthu; PraghatiPrakashan.
5. Physical Chemistry by K L Kapoor; Rajiv Beri for Macmillan india Ltd.

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

SUBJECT TITLE: CHEMISTRY LABORTARY-I

SUBJECT CODE: BCHE-1125

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of course: To impart knowledge of basics principles of chemistry phenomenons.

List of Experiments:

INORGANIC 1. Semi-micro analysis: Cation analysis, separation and identification of Groups I, II, III, IV, V and VI. Anion analysis (2 cation and 2 anion with no interference).
ORGANIC 2. (a) Determination of melting point of following solids: naphthalene, benzoic acid, acetanilide & urea. (b) Determination of boiling point of following liquids: ethanol, cyclohexane, propanol, toluene.
3. Purification of organic compounds by crystallization: (a) Phthalic acid from hot water. (b) Acetanilide from boiling water. (c) Benzoic acid from water.

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-1125.1	understanding of theoretical knowledge
CO2	BCHE-1125.2	manipulation of measuring equipment
CO3	BCHE-1125.3	enhancement of experimental knowledge and competences,
CO4	BCHE-1125.4	data investigation and problem solving expertise

Books Recommended:

1. Vogel's book on Inorganic Qualitative Analysis
2. Vogel's book on Organic Qualitative Analysis



RIMT
UNIVERSITY

Program: Bachelor of Science Non Medical
Program Code: NMED H 301

SYLLABUS

SEMESTER-II



SUBJECT TITLE: ELECTRICITY & MAGNETISM

SUBJECT CODE: BPHY-1221

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective and outcome of course: The student is exposed to Electrostatics and Magneto statics including Boundary value problems, Maxwell equations and their applications and analysis of Alternating current circuits

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT I	Electrostatics: Scalar and vector product, Gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only), Electrostatic Field, electric flux, Gauss's theorem of electrostatics and its application to plane charged sheet, charged conductor. Differential form of Gauss Law, Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, Calculation of electric field from potential, curl of electrostatic field, Capacitance of an isolated spherical conductor, Parallel plate, spherical and cylindrical condenser, Energy per unit volume in electrostatic field, Dielectric medium, Dielectric Polarisation, Displacement vector, Gauss's theorem in dielectrics.	20
UNIT II	Magnetostatics: Biot-Savart's law & its applications to straight conductor, circular coil and solenoid carrying current. Ampere's circuital law, Divergence and curl of magnetic field, Magnetic vector potential Magnetic Properties of Matter: Magnetization vector (M). Magnetic Intensity(H), Magnetic Susceptibility and permeability, Relation between B, H, M Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, curl of electric field, self and mutual inductance, L of single coil, M of two coils, Reciprocity Theorem, Energy stored in magnetic field	13
UNIT-III	Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits, Complex Reactance and Impedance, Series LCR Circuit: (1) Resonance, (2) Power	



	Dissipation and (3) Quality Factor, and (4) Band Width, Parallel LCR Circuit Network theorems: Ideal Constant-voltage and Constant-current Sources, Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem, Applications to dc circuits	15
UNIT-IV	Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Modified Ampere's law, Maxwell's equations, Poynting Theorem & Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization	12

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-1221.1	Learn about Electrostatics: Electric Field, electrical potential and energy
CO2	BPHY-1221.2	Understand Magnetostatics including Boundary value problems, Magnetic properties of matter and Electromagnetic Induction
CO3	BPHY-1221.3	Analysis of Alternating current circuits and Network theorems
CO4	BPHY-1221.4	To study Maxwell's equations and Electromagnetic wave propagation

Books Recommended:

1. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
2. Electricity and Magnetism, Edward M. Purcell, Cambridge University Press, 2013
3. Introduction to Electrodynamics, D.J. Griffiths, Pearson education, 2015

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

SUBJECT TITLE: PHYSICS LAB-II

SUBJECT CODE: BPHY-1222

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam: 3 Hrs



Objective of course: The aim of this course is to build an understanding about various components of an electrical circuit and to develop skill to measure the related physical quantities.

Note: Students will be required to perform at least 10 experiments from the given list of experiments:

List of experiments
1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Measurement of charge and current sensitivity by using Ballistic Galvanometer
3. Determine a high resistance by Leakage Method
4. To determine Self Inductance of a Coil by Rayleigh's Method.
5. To compare capacitances using De'Sauty's bridge.
6. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
7. To study the Characteristics of a Series RC Circuit.
8. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
9. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor.
10. To determine a Low Resistance by Carey Foster's Bridge.
11. To determine the self inductance of the coil using Anderson's Bridge
12. To find the capacitance of a capacitor using Flashing and Quenching of a Neon lamp.
13. To determine the value of an unknown resistance using Post Office Box.

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-1222.1	Analyze the physical principle involved in the various instruments; also relate the principle to new application
CO2	BPHY-1222.2	Demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.

Books Recommended:

1. A Text Book of Practical Physics, I. Prakash & Ramakrishna, Kitab Mahal, 2011
2. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010

SUBJECT TITLE: CALCULUS-II

SUBJECT CODE: BMAT-1221

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40



Objective:

This course is aimed to provide an introduction to the function of two or more variables and their partial differentiation and maxima and minima of function of several variables and use of double and triple integration to find areas and volumes..

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Function of two or more variables; partial differentiation, homogeneous functions and Euler's theorem, composite functions, total derivative, derivative of an implicit function, change of variable.	10
UNIT-II	Jacobian, Tangent and normal to a surface .Taylors and Maclaurin's series for a function of two variables, errors and approximations.	10
UNIT-III	Maxima and minima of function of several variables, Lagrange's method of undetermined multipliers.	10
UNIT-IV	Double and triple integral and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT-1221.1	To learn about function of two variables.
CO2	BMAT-1221.2	To acquire the knowledge of partial differentiation, homogenous function, total derivatives.
CO3	BMAT-1221.3	To expand different functions using Taylors and Maclaurin's series.
CO4	BMAT-1221.4	To understand the method for solving Double and triple integral and their applications in different areas

Recommended Books:

1. Thomes, G.B, Finney, R.L. Calculus and Analytic Gemetry, Ninth Edition, 1995.
2. N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow, 1964.
3. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad, 2016.
4. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 2007.

Instruction of Question Paper setter



The paper setter is required to set question paper in three sections A , B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

SUBJECT TITLE: Modern Algebra

SUBJECT CODE: BMAT-1222

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective:

The objective of this course is to present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Groups: Definition, examples, subgroups, counting Principle, Lagrange's Theorem, Normal subgroups Quotient groups.	15
UNIT-II	Homo-morphisms, Fundamental theorem of homomorphism and related theorems. Cyclic Groups.	10
UNIT-III	Rings: Definition and examples of Rings, Elementary properties of Rings. Sub-rings, Homomorphism.	10
UNIT-IV	Ideals and Quotient Rings Field of Quotient of Integral domain, division rings. Euclidean Rings, Principal ideals.	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT-1222.1	To acquire the knowledge of groups, subgroups and counting principle
CO2	BMAT-1222.2	Students will learn about Homomorphism , Cyclic Groups and their properties.
CO3	BMAT-1222.3	To understand about rings and subring
CO4	BMAT-1222.4	After completing the course, students would be able to know about ideals and Quotient Rings Field of Quotient of Integral domain.



Recommended books:

1. Text book on Algebra and Theory of equations by Chandrika Prasad. Pothishala Pvt. Ltd.1982.
2. Herstein, I.N.: Topics in Algebra, John Wiley & Sons; 2nd edition (June 20, 1975).
3. Linear Algebra by Schaum Outline series McGraw-Hill Education; 5 edition (December 11, 2012).

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A , B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each

COURSE TITLE: ENVIRONMENTAL SCIENCE

SUBJECT CODE: BEVS-1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course Objectives:

1. To estimate the current world population scenario and thus calculating the economic growth, energy requirement and demand.
2. To understand the conceptual process related with the various climatologically associated problems and their plausible solution

Sr.No	Contents	Contact Hours
UNIT I	<p>The Multidisciplinary Nature of Environmental Studies Definition, scope and importance, Need for public awareness</p> <p>Natural Resources and associated problems.</p> <p>a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.</p>	7



	<p>b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems</p> <p>c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.</p> <p>d. Food resources: World food problems, changes caused by agriculture and Overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.</p> <p>e. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies</p> <p>f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.</p> <p>g. Role of an individual in conservation of natural resources.</p> <p>h. Equitable use of resources for sustainable lifestyles</p>	
UNIT II	<p>Ecosystems</p> <p>(a) Concept of an ecosystem.</p> <p>(b) Structure and function of an ecosystem.</p> <p>(c) Producers, consumers and decomposers.</p> <p>(d) Energy flow in the ecosystem.</p> <p>(e) Ecological succession.</p> <p>(f) Food chains, food webs and ecological pyramids.</p> <p>(g) Introduction, types, characteristic features, structure and function of the following ecosystem:</p> <p>i) Forest ecosystem.</p> <p>ii) Grassland ecosystem.</p> <p>iii) Desert ecosystem.</p> <p>iv) Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).</p> <p>Biodiversity and its Conservation</p> <p>(a) Introduction - Definition: genetic, species and ecosystem diversity.</p> <p>(b) Biogeographically classification of India.</p> <p>(c) Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and</p> <p>(d) Option values.</p> <p>(e) Biodiversity at global, national and local levels.</p> <p>(f) India as a mega-diversity nation.</p> <p>(g) Hot-spots of biodiversity.</p> <p>(h) Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.</p> <p>(i) Endangered and endemic species of India.</p> <p>(j) Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.</p>	7
UNIT	Environmental Pollution: Definition	7



III	<p>(a) Causes, effects and control measures of: (i) Air pollution (ii) Water pollution (iii) Soil pollution (iv) Marine pollution (v) Noise pollution (vi) Thermal Pollution (vii) Nuclear pollution</p> <p>(b) Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.</p> <p>(c) Role of an individual in prevention of pollution.</p> <p>(d) Pollution Case Studies.</p> <p>(e) Disaster management: floods, earthquake, cyclone and landslides</p> <p>6. Social Issues and the Environment</p> <p>(a) From unsustainable to sustainable development</p> <p>(b) Urban problems and related to energy</p> <p>(c) Water conservation, rain water harvesting, Watershed Management</p> <p>(d) Resettlement and rehabilitation of people; its problems and concerns. Case studies.</p> <p>(e) Environmental ethics: Issues and possible solutions</p> <p>(f) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.</p> <p>(g) Wasteland reclamation</p> <p>(h) Consumerism and waste products</p> <p>(i) Environmental Protection Act</p> <p>(j) Air (Prevention and Control of Pollution) Act</p> <p>(k) Water (Prevention and control of Pollution) Act</p> <p>(l) Wildlife Protection Act</p> <p>(m) Forest Conservation Act</p> <p>(n) Issues involved in enforcement of environmental legislation</p> <p>(o) Public awareness</p>	
UNIT IV	<p>Human Population and the Environment</p> <p>(a) Population growth, variation among nations</p> <p>(b) Population explosion - Family Welfare Programmed</p> <p>(c) Environment and human health</p> <p>(d) Human Rights</p> <p>(e) Value Education</p> <p>(f) HIV/AIDS</p> <p>(g) Women and Child Welfare</p> <p>(h) Role of Information Technology in Environment and Human Health</p> <p>(i) Case Studies</p> <p>Field Work</p> <p>(a) Visit to a local area to document environmental assets river/ (b) forest/grassland/hill/mountain</p> <p>(c) Visit to a local polluted site - Urban / Rural / Industrial / Agricultural (d) Study of common plants, insects, birds</p> <p>(e) Study of simple ecosystems-pond, river, hill slopes, etc. (Field</p>	8

	work equal to 5 lecture hours)	
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COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BEVS-1201.1	Gain knowledge about environment and ecosystem.
CO2	BEVS-1201.2	Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.
CO3	BEVS-1201.3	Gain knowledge about the conservation of biodiversity and its importance.
CO4	BEVS-1201.4	Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.

Recommended Books

1. J.G. Henry and G.W. Heinke, 'Environmental Sc. & Engineering', Pearson Education, 2004.
2. G.B. Masters, 'Introduction to Environmental Engg. & Science', Pearson Education, 2004.
3. Erach Bharuch, 'Textbook for Environmental Studies', UGC, New Delhi, 2003.

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: ORGANIC CHEMISTRY-II

SUBJECT CODE: BCHE-1223

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of course: To impart advance knowledge of Aliphatic & Aromatic compounds.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Alkanes & Cycloalkanes: IUPAC nomenclature of branched & 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 and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and	10



	<p>selectivity.</p> <p>Cycloalkanes--nomenclature,method of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strain less rings. The case of cyclopropane ring: banana bonds.</p> <p>Alkenes: Nomenclature of alkenes-methods of formation, mechanisms and dehydration of alcohols, dehydrohalogenation of alkyl halides regioselectivity in alcohol dehydration. The Saytzeff's rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions Markownikoff's rule, Antimarkownikoff's rule, hydroboration-oxidation, oxymercuration reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4. Polymerization of alkenes. Substitution at allylic and vinylic positions of alkenes.</p>	
UNIT-II	<p>Cycloalkenes: Methods of formation, conformation and chemical reactions of Cycloalkenes. Dienes and Alkynes: Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization of dienes, Chemical reactions-1,2 and 1,4 additions, Diels-Alder reaction. Nomenclature of alkynes, Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation. metal-ammonia reductions, oxidation and polymerization.</p>	10
UNIT-III	<p>Aromatic Hydrocarbons: Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocations/carbanions & heterocyclic compounds with suitable examples, antiaromaticity & nonaromaticity; structure & stability of benzene, Electrophilic aromatic substitutions- nitration, halogenation, sulphonation and Friedel-Crafts alkylation/acylation with their mechanism, stability of Wheland intermediates (sigma complex), activation/deactivation of the aromatic ring & directing effects of the groups.</p>	5
UNIT-IV	<p>Aryl halides: Nomenclature and classes of alkyl halides, methods of formation, Nucleophilic aromatic substitution, The addition elimination and the elimination-additional mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides, allyl, benzyl, vinyl and aryl halides towards the nucleophilic substitutions.</p>	5

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-1223.1	Recognize the basic practical skills for the synthesis of alkenes, alkynes, alkyl halides.
CO2	BEVS-1223.2	Able to predict the reactivity of organic compound from its structure.
CO3	BEVS-1223.3	Able to understand the rules for naming different organic compounds
CO4	BEVS-1223.4	Able to recognize mechanism for given chemical reaction.



Books Recommended:

1. Robert Thornton Morrison and Robert Neilson Boyd, Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. I.L. Organic Chemistry (Volume I), Darling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. I.L. Finar, Organic Chemistry (Volume II): Stereochemistry & the chemistry of natural products, Darling Kindersley (India) Pvt. Ltd. (Pearson Education).

Instruction of Question Paper setter: The question paper consists of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: INORGANIC CHEMISTRY-I

SUBJECT CODE: BCHE-1224

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of Course: To impart knowledge of basics of inorganic chemistry i.e. atomic structure and bonding

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Atomic Structure: Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of, Ψ and Ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curve, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements and ions. Chemistry of Noble gases: Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.	10
UNIT-II	Chemical Bonding-I: 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 , SnCl_2 , XeF_4 , BF_4^- , PF_6^- , SnCl_6^{2-} . Chemical Bonding-II: Valence shell electron pair repulsion (VSEPR) theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2 , and H_2O . MO theory, homonuclear (elements and ions of 1st and 2nd row), and heteronuclear (BO , CN , CO^+ , NO^+ , CO , CN), diatomic molecules, multicenter bonding in electron deficient molecule (Boranes) percentage ionic character from dipole moment and electronegativity difference.	10



UNIT-III	<p>Ionic Solids: Concept of close packing, Ionic structures, (NaCl type, Zinc blende, Wurtzite, CaF₂, and antiferite), radius ratio rule and coordination number, Limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond-free electron, valence bond and bond theories.</p> <p>Weak Interactions-Hydrogen bonding, van der Waals forces.</p> <p>Periodic Properties: Position of elements in the periodic table, effective nuclear charge and its calculations. Atomic and ionic radii, ionization energy, electron affinity and electronegativity-definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.</p>	20
UNIT-IV	<p>S-Block Elements: Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls.</p> <p>Group No. 13: Comparative study (including diagonal relationship) of groups 13 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13; hydrides of boron-diborane and higher boranes, borazine, borohydrides.</p> <p>p-Block Elements: Comparative study (including diagonal relationship) of groups 14-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 14-17; fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphurtetranitride, basic properties of halogens, interhalogens and polyhalides.</p>	20

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-1224.1	Tell the name of orbitals by recognizing shapes of orbitals.
CO2	BEVS-1224.2	Calculate bond order of different molecules.
CO3	BEVS-1224.3	Draw MO diagrams of different molecules.
CO4	BEVS-1224.4	Draw structures of different ionic solids

Books Recommended:

1. Stereochemistry of Carbon Compounds by Ernest, L. Eliel, Tata McGraw-Hill.
2. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
3. Stereochemistry of Organic Compounds, P.S. Kalsi, New Age, International.
4. Modern Organic Reactions, H.C. House, Benjamin.

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.

3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: CHEMISTRY LABORTARY-II

SUBJECT CODE: BCHE-1225

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 60

End Term Exam: 40

Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of titrations and kinetics, potentiometry and colorimeter

List of Experiments:

Inorganic Experiments

1. Iodometry and Iodimetry Titrations:

- (i) Standardisation of sodium thiosphate with $K_2Cr_2O_7$ / KIO_3
- (ii) Determination of $Cu(II)$
- (iii) Determination of H_2O_2
- (iv) Determination of available chlorine in bleaching powder.

2. Precipitation Titrations

- (i) $AgNO_3$ – standardisation by Mohr’s method / by using absorption indicator.
- (ii) Determination of chloride.
- (iii) Volhard’s method for chloride determination.

Physical Chemistry Experiments

Chemical Kinetics

- 3. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
- 4. To study the effect of acid strength on the hydrolysis of an ester.
- 5. Viscosity & Surface Tension of pure liquids.
- To determine the viscosity and surface tension of C_2H_5OH and glycerin solution in water
- 6. Molecular weight determined by Part method.

Colorimetry

- 7. To test the validity of Beer Lambert law.

Potentiometry

- 8. Titration of strong acid solution (HCl) with $NaOH$ solution using quinhydrone electrode.
- 9. Titration of a mixture of strong and weak acids ($HCl + CH_3COOH$) and hence the composition of the mixture.



COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-1225.1	understanding of theoretical knowledge
CO2	BCHE -1225.2	manipulation of measuring equipment
CO3	BCHE -1225.3	enhancement of experimental knowledge and competences,
CO4	BCHE -1225.4	data investigation and problem solving expertise

Books Recommended:

- 1.Vogel's book on Inorganic Qualitative Analysis
- 2.Advanced Practical Physical Chemistry By J. B. Yadav

SYLLABUS

SEMESTER-III



SEMESTER: III

COURSE TITLE: STATISTICAL PHYSICS AND THERMODYNAMICS

SUBJECT CODE: BPHY-2321

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of Course: The objective of this course is to develop a working knowledge of the laws and methods of thermodynamics & statistical physics and to use this knowledge to explore various applications. Many of these applications will relate to topics in materials science and the physics of condensed matter.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Statistical definition of entropy, change of entropy of a system, additive nature of entropy, law of increase of entropy, reversible and irreversible processes with examples, Work done in a reversible process, Examples of increase of entropy in natural processes, Entropy and disorder, Brief review of the terms and Laws of Thermodynamics, Carnot's Cycle, Entropy changes in Carnot's Cycle. Applications of thermodynamics to thermoelectric effect, change of entropy along a reversible path in a P.V. diagram, entropy of a perfect gas, Equation of state of ideal gas from simple statistical consideration	15
UNIT-II	Derivation of Maxwell's thermodynamical relations, cooling produced by adiabatic stretching, adiabatic compression, change of internal energy with volume, Expression for $(C_p - C_v)$, change of state and Clayperon Equation, Thermodynamical treatment of Joule-Thomson effect, Use of Joule-Thomson effect for liquification of helium, Production of very low temperature by adiabatic demagnetization,	15



UNIT-III	Basic ideas of Statistical Physics, Scope of Statistical Physics, basic ideas about probability, distribution of four distinguishable particles in two compartments of equal size. Concept of macrostates, microstates, thermodynamic probability, effects of constraints on the system, distribution of n particles in two compartments, deviation from the state of maximum probability, equilibrium state of dynamic system, distribution of distinguishable n particles in k compartments of unequal sizes.	10
UNIT-IV	Phase space and its division into elementary cells, three kinds of statistics. The basic approach in the three statistics, Maxwell-Boltzman statistics applied to an ideal gas in equilibrium, experimental verification of Maxwell-Boltzman's law of distribution of molecular speeds. Need of quantum statistics--B.E. statistics, derivation of Planck's law of radiation, deduction of Wien's displacement law, Rayleigh Jeans Law and Stefan's law from Planck's law, F.D. statistics, Electron gas Comparison of M.B., B.E. and F.D. statistics	20

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-2321.1	Explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics.
CO2	BPHY-2321.2	Apply the principles of classical and quantum theory of radiation.
CO3	BPHY-2321.3	Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions
CO4	BPHY-2321.4	Use the statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems

Books Recommended:

1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 2008, Tata McGraw-Hill.
2. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger, Narosa Publications, 1988
3. Thermal & statistical Physics, R. B Singh, New academic Science, 2011
4. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, Tata McGraw Hill, 2007

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.



COURSE TITLE: VIBRATION & WAVES

SUBJECT CODE: BPHY-2322

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of Course: The course covers Harmonic oscillations and coupled oscillations, wave motion in damped, driven media.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Simple harmonic motion, energy of a SHM, Compound Pendulum, Torsional Pendulum, Electrical Oscillations, Transverse Vibrations of a mass on a string, composition of two perpendicular SHM of same period and of period in ratio 1: 2.	8
UNIT-II	Decay of free vibrations due to damping, differential equation of motion, types of damping, determination of damping co-efficient; Logarithmic decrement, relaxation time and Q- Factor, Electromagnetic damping (Electrical oscillator)	14
UNIT-III	Differential equation for forced mechanical and electrical oscillators, Transient and steady state behavior, Displacement and velocity variation with driving force frequency, variation of phase with frequency, resonance. Power supplied to an oscillator and its variation with frequency, Q-value and band width, Q-value as an amplification factor. Stiffness, coupled oscillators, Normal co-ordinates and normal modes of vibration, Inductance coupling of electrical oscillators.	6
UNIT-IV	Waves in physical media, Wave equation and its solution, Types of waves, particle velocity, acceleration and energy in progressive waves, Longitudinal waves on a rod. Transverse waves on a string, characteristic impedance of a string, Waves in absorbing media, Reflection and Transmission of transverse waves on a string at discontinuity, Reflection and transmission of energy, Reflection and transmission of longitudinal waves at a boundary, Standing wave ratio, Impedance matching, Energy of vibrating string., Wave and group velocity	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-2322.1	Carry out calculations involving the wave speed, wavelength, frequency and period of a sound wave.
CO2	BPHY-2322.2	Understand simple harmonic motion (SHM), be able to derive and solve the equations of motions for physical systems that undergo SHM
CO3	BPHY-2322.3	Understand the concept of coupled oscillators, be able to derive and solve the equations of motion for simple systems and describe motion of coupled oscillators in



		terms of normal mode solutions
CO4	BPHY-2322.4	Describe the differences between light and sound

Books Recommended:

1. S P Puri, Vibrations and Waves, Macmillan India Ltd., 2004.
2. H.J Jain, The Physics of Vibrations and Waves, John Wiley and Sons. 2013
3. N. K Bajaj, The Physics of Waves and Oscillations, Tata McGraw Hill, 1998

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks.
2. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: PHYSICS LAB-III

SUBJECT CODE: BPHY-2323

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60

End Term Exam: 40

Duration of Exam: 3 Hrs

Objective of Course:The course covers experiments related to analogue electronics, characteristics of electronics devices, damped, driven and forced oscillations, and wave motion in media.

Note: Students will be required to perform at least 12 experiments from the given list of experiments

List of Experiments
1. Measurement of Planck's constant using LED.
2. To determine Stefan's Constant.
3. To determine the velocity of ultrasonic waves in a given liquid.
4. To measure the logarithmic decrement, coefficient of damping, relaxation time and quality factor of a simple damped pendulum.
5. To determine the frequency of AC mains using Electrical Vibrator.
6. To determine the frequency of electrically maintained tinning fork by means of Melde's apparatus in transverse mode of vibration.



7. To determine the frequency of a tuning fork using a sonometer.
8. To verify the laws of transverse vibrations of stretched strings using a sonometer.
9. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
10. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
11. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
12 . To find the velocity of sound in the material of the given rod with a Knudt's tube
13. To determine the temperature co-efficient of resistance by Platinum resistance thermometer
14. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
15. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-2323.1	Analyze the physical principle involved in the various instruments; also relate the principle to new application
CO2	BPHY-2323.2	Demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.

Books Recommended:

1. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010
2. A Text Book of Practical Physics, InduPrakash and Ramakrishna, KitabMahal, 2011

SUBJECT TITLE: Linear Algebra

SUBJECT CODE: BMAT-2321

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective:

The objective of this course is to make able such student for solving systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion. Carry out matrix operations, including inverses and determinants. Apply principles of matrix algebra to linear transformations.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Vector spaces, Examples, Linear Dependence, Linear Combinations, Bases and Dimension, Subspaces. Quotient Spaces.	10
UNIT-II	Direct Sum of vector spaces, Dimension of a direct sum, Dual of a vector space. Matrices and change of basis.	10
UNIT-III	Linear transformation, Algebra of linear transformations, Matrices as linear mappings, Kernel and image, Rank and Nullity theorem, Singular and non-singular linear mappings, Isomorphism.	10
UNIT-IV	Composition of linear mappings Polynomials and linear operators, Square matrices as linear operators, matrix representation of a linear operator, Change of basis, characteristic and minimal polynomial for linear operators.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT-2321.1	After the successful completion of this course student will be able to use computational techniques.
CO2	BMAT-2321.2	To develop algebraic skills essential for the study of systems of linear equations, matrix algebra, Vector spaces.
CO3	BMAT-2321.3	To learn about concept of basis, dimensions and quotient spaces.
CO4	BMAT-2321.4	To understand the concept of linear transformation and linear mapping.

Recommended books:

1. Text book on Algebra and Theory of equations by Chandrika Prasad. Pothishala Pvt. Ltd.2017
2. Herstein, I.N.: Topics in Algebra, Wiley Eastern Limited. 2006
3. Linear Algebra by Schaum Outline series.4th Edition.
4. Surjeet Singh and QaziZameeruddin: Modern Algebra. S. Chand Publishing 8th Edition (Relevant portion)

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A, B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

SUBJECT TITLE: Differential Equations

SUBJECT CODE: BMAT-2322



SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective:

The objective of this course is to demonstrate understanding of the theoretical concepts and select and use appropriate models and techniques for finding solutions to differential equations-related problems with and without technology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	First order differential equations: Order and degree of a differential equation, separable differential equations, Homogeneous differential equations, equations reducible to Homogenous differential equations Exact differential equations. Linear differential equations and equations reducible to linear differential equations.	10
UNIT-II	Higher order differential Equations: Solution of Linear homogeneous and non-homogeneous differential equations of higher order with constant coefficients and with variable coefficients, method of Variation of Parameters.	10
UNIT-III	Differential operator method, Linear non-homogeneous differential equations with variable coefficients, Euler's Cauchy method. Series solution of Differential equation: Regular point, ordinary point, Power Series method, Forbinious method.	10
UNIT-IV	Bessel, Legendre and Bessel Equations, Legendre and Bessel functions and their properties, recurrence relations, Orthogonality, Rodrigue's formula.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT-2322.1	After the successful completion of this course student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli equations.
CO2	BMAT-2322.2	To develop skills essential for finding complete solution of a non-homogeneous differential equation as a linear combination of the complementary function and a particular solution.
CO3	BMAT-2322.3	Student will be introduced to the complete solution of a non-homogeneous differential equation with constant coefficients by the method of undetermined coefficients.



CO4	BMAT-2322.4	To understand the concept of complete solution of a differential equation with constant coefficients with variation of parameters
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Recommended books:

1. H.T.H. Piaggio : An Elementary Treatise on Differential equations : Barman Press. 2007
2. R. K. Jain and S.R.K. Iyengar: Advanced Engineering Mathematics, Narosa Publishing House. Edition: 5th, 2016
3. ZafarAhsan: Differential Equations and Their Applications, Prentice-Hall of India Pvt. Ltd. Second Edition , Fourteenth Printing, July 2013
4. I. N. Sneddon : Elements of Partial Differential Equations, McGraw Hill Book Co. 2006
5. RaiSinghania : Ordinary and Partial Differential Equations” , S.Chand&Company, New Delhi. 19th Edition, 2017

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A, B and C. Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

COURSE TITLE: ORGANIC CHEMISTRY-III

SUBJECT CODE: BCHE-2324

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of organic chemistry i.e. alcohols, aldehydes and ketones

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Alcohols: Classification and nomenclature: Monohydric Alcohols-nomenclature, methods of formation by reduction of aldehydes, ketone, carboxylic acids and esters. Hydrogen bonding, Acidic nature, Reactions of alcohols. Dihydric alcohols-nomenclature, methods of formation, chemical reactions of vicinal glycols-nomenclature, methods of formation chemical reaction of vicinal glycols, oxidative cleavage with [Pb (OAc) and HIO ₄] and Pinacol-Pinacolone rearrangement.	8
UNIT-II	Trihydric alcohol-nomenclature, methods off formation and chemical reactions of glycerol. Phenols: Nomenclature, structure and bonding. Preparation of Phenols, physical	12



	properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reaction of phenols- electrophilic aromatic substitution, acylation and carboxylation Mechanisms of Fries rearrangement. Gattermann synthesis, Hauben-Hoesch reaction. Lederer-Miyanase reaction and Reimer-Tiemann reaction.	
UNIT-III	Aldehydes and Ketones-I Nomenclature and structure of the carbonyl group, Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3- dithianes, synthesis of ketones from nitrites and from carboxylic acids. Physical properties and Mechanism of nucleophilic addition to carbonyl group with particular emphasis of Benzoin, Aldol, Perkin and Knoevenagel condensations, Condensation with ammonia and its derivatives, Wittig reaction, and Mannich reaction.	6
UNIT-IV	Aldehydes and Ketones –II Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, LiAlH_4 and NaBH_4 reductions. Halogenation of enolizable ketones. An Introduction to unsaturated aldehydes and ketones, Michael addition.	4

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-2324.1	Recognize structures of acid halides, esters, amides, acid anhydrides.
CO2	BCHE-2324.2	To convert given name of alcohol to structure.
CO3	BCHE-2324.3	To write the order of reactivity of different carboxylic acid derivatives.
CO4	BCHE-2324.4	To describe different classes of alcohols.

Recommended Books

1. Organic Chemistry, Morrison and Boyd, Prentice- Hall.
2. Fundamentals of Organic Chemistry, Solomons, John Wiley.
3. Organic Chemistry. F.A. Carey, McGraw Hill, Inc.
4. Organic Chemistry Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley
5. Eastern Ltd (New Age International).
6. Jarry March Mechanisms of Organic Chemistry, Wiley

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.



- Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
- Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: PHYSICAL CHEMISTRY-II

SUBJECT CODE: BCHE-2325

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of thermodynamics, phase equilibria and electro chemistry

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	<p>Thermodynamics-I Definition of thermodynamics terms: system, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials, Thermodynamic processes, Concept of heat and work, elementary idea of thermochemistry. 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 and inversion temperature, Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.</p> <p>Thermodynamics-II- (Part-a): Second law of thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature.</p> <p>Thermodynamics-II- (Part-b): Concept of entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criterion of spontaneity and equilibrium. Entropy change in ideal gases mixing of gases.</p>	15
UNIT-II	<p>Thermodynamics-III: Third law of thermodynamics, Nernst heat theorem, statement and 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</p>	5



	change. Variation of G and A with P, V and T.	
UNIT-III	<p>Phase Equilibrium: Statement and meaning of the terms-phase, component and degree of freedom, derivation of Gibbs phase rule; phase equilibria of one component system-water and S systems. simple eutectic Pb-Ag systems, desilverisation of lead. Liquid-Liquid mixtures-ideal liquid mixtures, Raoult's and Henry's law.Non-ideal system-azeotropes-HCl-HP and ethanol-water systems.</p> <p>Lower and upper consolute temperature, Effect of impurity on consolute temperature, immiscible liquids, steam distillation.Nernst distribution law, thermodynamic derivation & applications.</p>	10
UNIT-IV	<p>Electrochemistry-I(a): Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance with dilution.</p> <p>Migration of ions and Kohlrausch law.Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations.Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only).</p> <p>Electrochemistry-I(b): Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductance measurements: determination of degree of dissociation, determination of K. of acids, determination of solubility product of a sparingly soluble salts, conductometric titrations.</p> <p>Electrochemistry-II:Types of reversible electrodes--gas-metal ion, metal-metal ion, metal-insoluble salt-anion and redox electrodes.Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes-standard electrode.potential, sign conventions, electrochemical series and its significance.</p> <p>Electrolyte and Galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cells.</p> <p>EMF of a cell and its measurements, Computation of cell EMF.Calculation of thermodynamic quantities of cell reaction (G, H and K), polarization, over potential and hydrogen over voltage.</p> <p>Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient potentiometric titrations. Definition of pH and pK., determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods. Buffers--mechanism of buffer action, Henderson-Hasselbalch equation, Hydrolysis of salts, Corrosion-types, theories and methods of combating it.</p>	15

COURSE OUTCOMES: On completion of this course, the students will be able to



CO1	BCHE-2325.1	Recognize the basic concepts of thermodynamics
CO2	BCHE-2325.2	Able to predict the reversible and irreversible reaction
CO3	BCHE-2325.3	Able to understand the physical significance of third law of thermodynamics
CO4	BCHE-2325.4	Able to recognize the reaction of electrochemical cells and types

Books Recommended:

1. Thermodynamics for Chemists, S. Glasstone.
2. Chemical thermodynamics, P.A. Rock.
3. Principles of Physical Chemistry, S.H. Maron & C.F. Prutton.
4. Physical Chemistry, P.W. Atkins.
5. Physical Chemistry, Vol.2, K.L. Kapoor.
6. Physical Chemistry, K.J. Laidler.

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: CHEMISTRY LABORTARY-III

SUBJECT CODE: BCHE-2326

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of volumetric analysis and chromatography

Outcomes:

List of Experiments:

1. Determination of acetic acid in commercial vinegar using NaOH, Alakanity of water sample.
2. Determination of alkali content of antacid.
3. Estimation of calcium content in chalk as calcium oxalate by permanganometry
4. Estimation of hardness of water by EDT A.



5. Estimation of ferrous and ferric by dichromate method.
6. Estimation of copper using sodium thiosulphate
7. Thin Layer Chromatography
8. Determination of R_f values and identification of organic compounds.
9. Separation of green leaf pigments (spinach leaves may be used)
10. Preparation and separation of 2, 4-dinitrophenylhydrazones of acetone, benzophenonecyclohexanone using toluene and light petroleum (40 : 60).
11. Separation of a mixture of dyes

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE-2326.1	Estimate various metals (Ba, Zn, Fe, Ni, Cr, Pb) gravimetrically
CO2	BCHE-2326.2	Study kinetics of reaction between acetone and iodine and the hydrolysis acetates
CO3	BCHE-2326.3	Determine the solubility and solubility products of sparingly soluble compounds
CO4	BCHE-2326.4	Qualitative analysis of food and vegetable

Books Recommended:

1. Vogel's book on Inorganic Qualitative Analysis



RIMT
UNIVERSITY

Program: Bachelor of Science Non Medical
Program Code: NMED H 301

SYLLABUS

SEMESTER-IV



COURSE TITLE: QUANTUM PHYSICS

SUBJECT CODE: BPHY-2421

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective of Course: This course connects the historical development of quantum mechanics with previous knowledge and learns the basic properties of quantum world. The course also covers the applications of quantum mechanics in different area.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT I	Plancks's formula of Black body radiation and energy quantization, Wave-particle duality, Photoelectric effect, Compton effect, Pair production, De Broglie waves, wave packet, Phase velocity and Group velocity, Electron microscope, Particle in a box, Particle diffraction, Davisson-Germer experiment, Interferferometry with particles, Uncertainty principle with applications, Principle of complementarity,	10
UNIT II	Time-dependent Schrodinger equations, Born's interpretation of Wave function, complex character, continuity and boundary conditions, probability interpretation, normalization, Probabilty current, Probability conservation equation, Principle of	10



	superposition, Fundamental postulates of quantum mechanics, Eigenvalues and eigenfunctions,. Operator formalism, Position, momentum and energy operators, expectation values, Ehrenfest theorem, Hermitian operators	
UNIT III	Problems in One Dimension: Steady-state Schrodinger equation, Application to stationary states for one dimension, Potential step, Potential barrier, Tunnel effect, rectangular potential well, Quantum mechanics of simple harmonic oscillator, energy levels and energy eigen functions using Frobenius method, Hermite polynomials, ground state, zero point energy & uncertainty principle	10
UNIT IV	Quantum theory of hydrogen-like atoms: Time independent Schrodinger equation in spherical polar coordinates; separation of variables for second order partial differential equation, angular momentum operator & quantum numbers, Radial wave functions from Frobenius method, shapes of the probability densities for ground & first excited states, Orbital angular momentum quantum numbers l and m ; s, p, d,.. shells.	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-2421.1	To systematically introduce the founding principles of quantum mechanics through detailed analysis and synthesis of the pioneering works of Einstein
CO2	BPHY-2421.2	Show an understanding of wave mechanics in three dimensions
CO3	BPHY-2421.3	Understand the central concepts and principles in quantum mechanics
CO4	BPHY-2421.4	The uncertainty principle

Reference Books:

1. Concept of Modern Physics, A. Beiser, S. Mahajan and S. R. Choudhury, Tata McGraw Hill, 2011
2. Quantum Physics of Atoms, Molecular, R. Eisberg & R. Resnick, Second Edition, John Wiley, 2002.
3. Modern Physics, J. Bernstein, P.M. Fishbane, S.G. Gasiorowicz, Pearson, 2000.
4. Elements of Modern Physics, S.H. Patil, McGraw Hill, 1998.

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: OPTICS & LASER
SUBJECT CODE: BPHY-2422



SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective of Course: The course provides an extensive discussion of optical phenomena such as interference, diffraction, polarization and laser

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT I	Interference: Concept of coherence, spatial and temporal coherence, coherence time, coherence length, area of coherence, Conditions for observing interference fringes, Interference by wavefront division and amplitude division, Young's double slit experiment, Lloyd's mirror and Fresnel's biprism, phase change on reflection, Michelson interferometer-working, principle and nature of fringes, Interference in thin films, Role of interference in anti-reflection and high reflection dielectric coatings, Multiple beam interference, Fabry-Perot interferometer, nature of fringes	12
UNIT II	Diffraction: Huygen-Fresnel theory half period zones, zone plates, Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at rectangular and circular apertures, Effects of diffraction in optical imaging, resolving power of microscope, telescope, Fabry-Perot interferometer. The diffraction grating, its use as a spectroscopic element, resolving power, Moire's fringes	08
UNIT III	Polarization: Concept and analytical treatment of unpolarised, plane polarized and elliptically polarized light. Double refraction, Nicol prism, sheet polarisers, retardation plates, Production and analysis of polarized light (quarter and half wave plates)	07
UNIT IV	LASER: Interaction of light with matter: Absorption, spontaneous emission, stimulated emission, Characteristics of stimulated emission, Einstein coefficients and their relations, Light amplification, Population inversion, Lasing action, Components of Laser, Elementary theory of optical cavity, longitudinal and transverse modes, Principal pumping schemes, Three level and four level laser schemes, Types of lasers, Ruby and Nd : YAG lasers. He-Ne, and CO ₂ lasers, Semiconductor lasers, Holography. Principle, recording of hologram and reconstruction of image, Theory of holography	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-2422.1	Formulation & analysis of interference pattern, Michelson and Fabry Perrot Interferometer.
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CO2	BPHY-2422.2	Formulation & analysis of diffraction pattern of single, double slit and study resolving power of various instruments
CO3	BPHY-2422.3	Working principle of laser & their applications
CO4	BPHY-2422.4	Apply the principles of atomic physics to materials used in optics and photonics, Working principle of optical fibres

Reference Books:

1. Subramanayam, N.; Lal, B. and Avadhamulu; M. N. Textbook of Optics. New Delhi: S. Chand & Company, 2006.
2. Jenkins, F.A.; White, H.E. Fundamentals of Optics. USA: McGrawHill Publication,
3. Ghatak,A. Optics. New Delhi:Tata McGraw Hill Publication, 2008.

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: PHYSICS LAB-IV

SUBJECT CODE: BPHY-2423

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60

End Term Exam: 40

Duration of Exam; 3 Hrs

Objective: The objective of this lab is to highlight to study the properties of light through experiments related to interference, diffraction and polarization

Note: Students will be required to perform at least 10 experiments from the given list of experiments

List of Experiments
1. To determine the wavelength of laser source using diffraction of single slit.
2. To determine the wavelength of laser source using diffraction of double slits.
3. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
4. To determine refractive index of the Material of a prism using sodium source.
5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.



6. To determine the wavelength of Laser source using Michelson's interferometer.
7. To determine wavelength of sodium light using Fresnel Biprism.
8. To determine wavelength of sodium light using Newton's Rings
9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
10. To determine dispersive power and resolving power of a plane diffraction grating.
11. To verify the law of Malus for plane polarized light.
12. To determine the specific rotation of sugar solution using Polarimeter.
13. To study the polarization of light by reflection and determine the polarizing angle for air- glass interface.

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-2423.1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO2	BPHY-2423.2	Demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.

SUBJECT TITLE: Vector Analysis

SUBJECT CODE: BMAT-2421

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective:

The objective of this course is to introduce the fundamental ideas to explain the characteristics of scalar and vector valued functions and master these in calculations. provide a physical interpretation of the gradient, divergence, curl and related concepts give an account of important vector field models of Nature.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Vectors in the plane Cartesian Co-ordinates and vectors in spaces. Dot and cross products. Lines and planes in space, Cylinders and Quadric surfaces.	10



UNIT-II	Cylindrical and Spherical co-ordinates Vector valued functions and space curves. Arc length and Unit Tangent, vector curvature, Torsion	10
UNIT-III	Scalar and vector fields, differentiation of vectors, velocity and acceleration. Vector differential operators: Del, Gradient Divergence and Curl, their physical interpretations. Formulae involving Del applied to point functions and their products.	10
UNIT-IV	Line, surface and volume integrals Flux, Solenoidal and Irrotational vectors. Gauss Divergence theorem. Green's theorem in plane, Stoke's theorem (without proofs) and their applications.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT -2421.1	After the successful completion of this course student will be able to recognize the level set and graph-of-function to formulate equations of curves and surfaces
CO2	BMAT-2421.2	To understand concept of parameterized curve from algebraic, geometric and physical interpretations
CO3	BMAT -2421.3	Student will be introduced the concept of arc length and unit Tangent, vector curvature, torsion
CO4	BMAT -2421.4	To memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches

Recommended books:

1. Engineering Mathematics, Pearson by Babu Ram. 2nd Edition 2012.
2. Thomas and Finney: Calculus and Analytic Geometry. 9th Edition.
3. Liefhold, Louis: Calculus and Analytic Geometry. 6th Edition.
4. Ray Wylie, C., Advanced Engineering Mathematics, McGraw Hill. 6th Edition.

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A, B and C. Section A consists of 12 MCQs of 1 mark each, Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

SUBJECT TITLE: Discrete Mathematics

SUBJECT CODE: BMAT-2422

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40



Objective:

The objective of this course is to provide better understanding of logic sentence in terms of predicates, quantifiers, and logical connectives, operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion, determination of domain and range of a discrete or non-discrete function, graph functions, identify one-to-one functions, perform the composition of functions and the recursive or inductive step in applied problems and to give a recursive and a non-recursive definition for an iterative algorithm

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Introduction, Combination of Sets, ordered pairs, proofs of general identities of sets, relations, operations on relations Properties of relations, functions, Hashing Functions, equivalence relations, compatibility relations, partial order relations.	10
UNIT-II	Basic counting principles Permutations and combinations Inclusion and Exclusion Principle, Recurrence relations, Recurrence relations, Generating Function, its Application.	10
UNIT-III	Graph and planar graphs- basic terminology, Multi-graphs, Weighted Graphs. Paths and Circuits Shortest paths, Eulerian paths and circuits. Planar Graphs. Trees. Lattices and Algebraic Structures, Duality, Distributive and Complemented Lattices.	15
UNIT-IV	Boolean Lattices and Boolean Algebras, Boolean Functions and Expressions, Propositional Calculus. Design and Implementation of Digital Networks, Switching Circuits.	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT -2422.1	To understand concept of basic concepts of mathematics and its applications
CO2	BMAT-2422.2	To learn about relation and functions with its applications
CO3	BMAT -2422.3	Student will be introduced the concept of basic counting principles, set theory and logic, matrix theory and graph theory
CO4	BMAT -2422.4	To apply different skills for the use of graph in different fields

Recommended books:

1. D. Burton: Elementary Number Theory, McGraw-Hill. 7th Edition 2017
2. Niven and Zuckerman: An Introduction To Number Theory. 5th Edition, 2015.

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A , B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

COURSE TITLE: ORGANIC CHEMISTRY-IV
SUBJECT CODE: BCHE-2424
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective of Course :To impart knowledge of basics of carboxylic acids, ethers, nitrogen containing compounds

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	<p>Carboxylic Acids: Nomenclature, structure and bonding. physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids, Reactions of amides, Reactions of carboxylic acids, Mechanism of decarboxylation.</p> <p>Methods of formation and chemical reactions of halo acids. Hydroxyacids, maleic and tartaric acid, citric acids. (Structural Formula only),</p> <p>Methods of formation and chemical reaction of unsaturated monocarboxylic acids. Dicarboxylic acids, methods of formation and effect of heat and dehydrating agents.</p> <p>Carboxylic Acid Derivatives: Structure and nomenclature of acid chlorides,</p>	10



	esters.amides and acid anhydrides. Relative stability and reactivity of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic derivatives, chemical reactions, Mechanism of esterification and hydrolysis (acidic and Basic).	
UNIT-II	Ethers and Epoxides: Nomenclature of ethers and methods of their formation, physical properties, Chemical reactions-cleavage and autooxidation, Ziesel's Method. Synthesis of epoxide, acid and base catalyzed ring opening of epoxide, orientation of ring opening reactions of Grignard and organolithium reagents with epoxide. Fats, Oils and Detergents: Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils.Saponification value, iodine value, acid value.Soaps, synthetic detergents, alkyl and aryl sulphonates.	10
UNIT-III	Organic Compounds of Nitrogen a) Nitro Compounds Preparation of nitroalkanes and nitroarenes.Chemical reactions of nitroalkanes.Mechanism of nucleophilic substitution in nitroarenes and their reactions in acidic, neutral and alkaline media, Picric acid.	5
UNIT-IV	b) Amines Reactivity, structure and nomenclature of amines, physical properties. Stereochemistry of amines Separation of a mixture secondary and tertiary amines. Structural features effecting the basicity of amines. Amine salts as phase-transfer catalyst and preparation of alkyl and aryl amines (reduction of nitro compounds and nitriles), reductive amination of aldehydic and ketonic compounds Gabriel-phthalimide reaction, Hoffmann bromamide reaction.	5

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE -2424.1	Study chemistry of carbohydrates with special reference to structure and configuration of glucose and fructose.
CO2	BCHE -2424.2	Understand structure and aromaticity of benzene and mechanism of electrophilic substitution reactions
CO3	BCHE -2424.3	Study different classes of aromatic compounds such as aromatic halogen, nitro, amino, diazonium salts, aromatic sulphonic acids, phenols, aldehydes and ketones, aromatic acids, polynuclear hydrocarbons, heterocyclic compounds



Books Recommended:

1. Organic Chemistry, F.A.Carey, McGraw Hill Inc.
2. Organic Chemistry, Morrison & Boyd, Prentice Hall.

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: INORGANIC CHEMISTRY-II

SUBJECT CODE: BCHE-2425

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of Course: To impart knowledge of transition series, lanthanides and actinides

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	<p>Chemistry of Elements of First Transition Series Characteristic properties of d-block elements. Properties of the elements of the first transition series, their simple compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.</p> <p>Chemistry of Lanthanide Elements Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.</p>	15
UNIT-II	<p>Chemistry of Elements of Second and Third Transition Series General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states. Magnetic behavior, spectral properties & stereochemistry</p> <p>Chemistry of Actinides Elements General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.</p>	15



	Coordination Compounds Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.	
UNIT-III	Oxidation and Reduction: Use of redox potential data-analysis of redox cycle, redox stability to water-Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements. Acids and Bases: Arrhenius, Bronsted-Lowry, the Lux-Flood solvent system and Lewis concepts of acids and bases.	9
UNIT-IV	Non-aqueous Solvents: Physical properties of a solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid NH ₃ and liquid SO ₂	6

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE -2425.1	Study chemistry of Lanthanides and Actinides
CO2	BCHE -2425.2	Understand crystal field theory for coordination compounds and their electronic spectra
CO3	BCHE -2425.3	Study structure and bonding of Metal Carbonyls Metal Nitrosyls
CO4	BCHE -2425.4	Get knowledge of Environmental Chemistry including environmental pollutants, Green house effect and global warming. Acid rains, Ozone layer

Books Recommended:

1. J.D. Lee, Concise Inorganic Chemistry, 4th Ed.
2. J.E. Huheey, Inorganic Chemistry, Harper & Row.
3. F.A.Cotton and G. Wilinson, Advanced Inorganic Chemistry, Interscience Publishers.
4. N.N. Greenwood and A. Earnshaw, Chemistry of Elements, Pergamon Press

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.



1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: CHEMISTRY LABORTARY-IV

SUBJECT CODE: BCHE-2426

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 60

End Term Exam: 40

Duration of Exam: 3 Hrs

Objective of Course : To impart knowledge of qualitative analysis

1.	Detection of elements (N, S and halogens) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.
2.	To determine the solubility of benzoic acid at different temperatures and to determine H of the dissolution process.
3.	To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid/weak base.
4.	To determine the enthalpy of solution of solid calcium chloride

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE -2426.1	Determine the solubility of benzoic acid in water
CO2	BCHE -2426.2	Determine the distribution coefficient of benzoic acid between benzene and water
CO3	BCHE -2426.3	Determine the distribution coefficient of iodine in different solvents
CO4	BCHE -2426.4	Study order of reaction

Books Recommended:

1. Vogel A. I., Tatchell A. R., Furnis B. S., Hannaford A. J., Smith P.W.G., Vogel's Text Book of Practical Organic Chemistry, 5th Edn., Pubs: ELBS, 1989.
2. Pavia D.L., Lampanana G.M., Kriz G.S. Jr., Introduction to Organic Laboratory Techniques, 3rd
3. Advanced Practical Physical Chemistry By J. B. Yadav

SYLLABUS

SEMESTER-V



COURSE TITLE: ATOMIC AND MOLECULAR SPECTRA

SUBJECT CODE: BPHY-3521

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective and outcome of Course : This course is designed to study the spectrum of atom and molecules. The course also covers the effect of magnetic field on the spectral lines and its applications of spectroscopy in different area.

Sr. No	Contents	Contact Hours
UNIT I	One Electron atomic Spectra: Spectrum of Hydrogen atom, Line spectra, Electron Angular Momentum. Space Quantization, Electron Spin and Spin Angular Momentum, Stern Gerlach experiment, Larmor's Theorem, Spin Magnetic Moment, Spin-orbit coupling, Total angular momentum	8
UNIT II	Atoms in External Magnetic 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	8
UNIT III	Many electron atoms: Exchange symmetry of wave function, Symmetric and Antisymmetric Wave Functions, Pauli's Exclusion Principle, and periodic classification	12



	of elements, atomic spectra (Helium), Essential features of spectra of Alkaline-earth elements, Spectral Notations for Atomic States, Total angular momentum, Vector Model: Spin-orbit coupling, L-S and J-J coupling schemes, in atoms-L-S and J-J couplings, 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	
UNIT IV	Interaction energy ideas, X-ray spectra, Mosley law, Absorption spectra, Auger effect, General Considerations of Molecular spectra, 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	12

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY -3521.1	Calculate the Zeeman effect and the Lande g-factor
CO2	BPHY -3521.2	Calculate the effects of an electric field on the energy levels of the hydrogen atom (the Stark effect).
CO3	BPHY -3521.3	Discuss the rotational spectra of molecules
CO4	BPHY -3521.4	Understand how the new theory could explain the fine structure in the spectra of hydrogen and hydrogen-like ions, and how this theory can be extended to atoms which have a single electron in their outermost shell, i.e. the alkali metal atoms.

Recommended Books

1. Introduction to Atomic Spectra: H.E. White-Auckland McGraw Hill,
2. Elements of Spectroscopy, Gupta, Kumar and Sharma, PragatiPrakashan, Meerut, 2016
3. Atomic and MoleculerSpectra:Laser , Raj Kumar, KedarNath Ram Nath Publications.

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: SOLID STATE PHYSICS



SUBJECT CODE: BPHY-3522

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective and outcome of Course : The aim of this course is to provide students with a background and understanding of the fundamentals of the solid state physics and to expose them to some exciting current research in this field

Sr. No	Contents	Contact Hours
UNIT I	Crystal structure, Symmetry operations for a two and three dimensional crystal, Two dimensional Bravais lattices, Three dimensional Bravais lattices, Basic primitive cells, Crystal planes and Miller indices, Diamond and NaCl structure. Crystal Diffraction: Bragg's law, Experimental methods for crystal structure studies, Laue equations, Reciprocal lattices of SC, BCC and FCC, Bragg's law in reciprocal lattice, Brillouin zones and its construction in two and three dimensions, Structure factor and atomic form factor	12
UNIT II	Lattice Vibrations and Phonons: Concepts of phonons, Scattering of photons by phonons, linear monoatomic and diatomic Chains, Density of modes, Acoustical and Optical Phonons, Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids, T^3 law	10
UNIT III	Magnetic Terminology, Types of Magnetism, Classical Langevin Theory of diamagnetism and Paramagnetism, Quantum Mechanical Treatment of diamagnetism and Paramagnetism, Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains, Discussion of B-H Curve, Hysteresis and Energy Loss, Basic Idea of Antiferromagnetism and Ferrimagnetism.	10
UNIT IV	Free electron model of metals, free electron, Fermi gas and Fermi energy, Band Theory: Kronig- Penney model, Metals and insulators, Qualitative discussion of the following: Conductivity and its variation with temperature in semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, band gap in semiconductors Superconductivity: Experimental Results, Critical Temperature, Critical magnetic field, Meissner effect. Type I and type II Superconductors, Isotope effect.	12

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY -3522.1	To provide students with a background and understanding of the fundamentals of the solid state physics and to expose them to some exciting current research in this field
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CO2	BPHY -3522.2	Analyze different types of matter depending on nature of chemical bonds and their properties
CO3	BPHY -3522.3	Analyze the crystal structures by applying crystallographic parameters
CO4	BPHY -3522.4	To determine the crystal structure by analysis of XRD data

Recommended Books:

1. Introduction to Solid State Physics by C. Kittel (Wiley Eastern)
2. Solid State Physics by S.O Pillai, New Age International Publisher
3. Solid State Physics by Puri and Babbar.

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: GENERAL PHYSICS LAB-V

SUBJECT CODE: BPHY-3523

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60

End Term Exam: 40

Duration of Exam; 3 Hrs

Objective: The objective of this lab is to highlight to study the properties of light through experiments related to interference, diffraction and polarization

Note: Students will be required to perform at least 10 experiments from the given list of experiments

List of Experiments
1. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
2. To determine the Planck's constant using LEDs of at least 4 different colours.



3. To determine the wavelength of H-alpha emission line of Hydrogen atom.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. Study of Zeeman Effect: with external magnetic field; Hyperfine splitting
9. Measurement of Planck's constant using black body radiation and photo-detector
10. Measurement of susceptibility of FeCl ₃ (Quinck's Tube Method)
11. To measure the Magnetic susceptibility of Solids.
12. To measure the Dielectric Constant of a dielectric Materials
13. To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.
14. To find energy band gap of semiconductor using P-N junction diode.
15. To determine the Hall coefficient of a semiconductor sample.

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY -3523.1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO2	BPHY -3523.2	Demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results

Books Recommended:

1. A Text Book of Practical Physics, I.Prakash& Ramakrishna, KitabMahal, 2011
2. Elements of Solid State Physics, J.P. Srivastava, Prentice-Hall of India, 2006
3. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010

SUBJECT TITLE: Statics

SUBJECT CODE: BMAT-3521

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective:

The purpose of the study of statics is to develop an understanding of the principles of statics and the ability to analyze problems in a systematic and logical manner, including the ability to



draw free-body diagrams. Ability to analyze the statics of calculation of the reactions necessary to ensure static equilibrium and knowledge of internal forces and moments in members.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Statics: Basic notation, Newton Laws of motion, system of two forces, parallelogram law of forces, resultant of two collinear forces, resolution of forces, moment of a force, couple, theorem on moments of a couple.	10
UNIT-II	Co planer forces, resultant of three coplanar concurrent forces, theorem of resolved parts, resultant of two forces acting on a rigid body, Varignon's theorem, generalized theorem of moments.	10
UNIT-III	Equilibrium of two concurrent forces, equilibrium condition for any number of coplanar concurrent forces, Lami's theorem. $\lambda - \mu$ theorem, theorems of moments.	10
UNIT-IV	Resultant of a force and a couple. Equilibrium conditions for coplanar non-concurrent forces. Friction: Definition and nature of friction, laws of friction, Centre of gravity.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT -3521.1	To understand concept of basic concepts of laws of motion and force with its applications.
CO2	BMAT -3521.2	To learn about fundamentals of Mechanics, equation of static equilibrium & dynamic equilibrium of particles and rigid bodies
CO3	BMAT -3521.3	Student will be introduced the concept of effect of friction on equilibrium
CO4	BMAT -3521.4	To learn working skills of kinematics, kinetics of particle and rigid body, related principles

Recommended Books:

- 1) S.L. Loney: The elements of statics and dynamics, Cambridge University Press. 4th Edition, 2014
- 2) J. L. Synge and B. A. Griffith : Principles of mechanics, Published by Nabu Press.2013

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A, B and C. Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

SUBJECT TITLE: Calculus of Variations
SUBJECT CODE: BMAT-3522
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs
Objective:

The prerequisites for this course is to develop Fully understanding of the properties of geometrical problems and familiar with Variational problems , isoperimetric problems with methods for solving boundary value problems.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Basic concepts of the calculus of variations such as Functionals, extremum, variations, function spaces, the Brachistochrone problem.	10
UNIT-II	Necessary condition for an extremum, Euler`s equation with the cases of one variable and several variables, Variational derivative.	10
UNIT-III	Invariance of Euler`s Equations. Variational problem in parametric form. General Variation: Functionals dependent on one or two functions.	10
UNIT-IV	Derivation of basic formula, Variational problems with moving boundaries, Broken extremals, Weirstrass–Erdmann conditions.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BMAT -3522.1	To understand concept of basic concepts of functional with their applications
CO2	BMAT -3522.2	To apply the formula that determines stationary paths of a functional to deduce the differential equations for stationary paths in simple cases
CO3	BMAT -3522.3	Student will be introduced the concept of Euler-Lagrange equation or its first integral to find differential equations for stationary paths
CO4	BMAT -3522.4	To learn skills of solving differential equations for stationary paths, subject to boundary conditions, in straightforward cases

Recommended Books

1. Abdul J. Jerry, Introduction to Integral Equations with Applications, 2nd Ed., Clarkson University Wiley Publishers, 1999.
2. Chambers, L.I. G., Integral Equations: A short Course, International Text Book Company Ltd., 1976.
3. R. P. Kanwal, Linear Integral Equations, 2nd Ed., Birkhauser Boston, 1997.
4. Hochstadt Harry, Integral Equations, John Wiley & Sons, 1989.
5. I. M. Gelfand, S.V. Fomin, Calculus of Variations, Dover Books, 2000.
6. Weinstock Robert, Calculus of Variations with Applications to Physics and Engineering,

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A, B and C. Section A consists of 12 MCQs of 1 mark each, Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

COURSE TITLE: ORGANIC CHEMISTRY-V

SUBJECT CODE: BCHE-3524

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of course: To impart knowledge of basics of spectroscopy & organometallics

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Spectroscopy: Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (¹ H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling	15



	constants, areas of signals interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2 tribromoethane, ethyl acetate, toluene and acetophenone. Electromagnetic spectrum: Absorption Spectra Ultraviolet (UV) absorption spectroscopy-absorption laws (Beer-Lambert's 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	
UNIT-II	Infrared (IR): Infrared (IR) absorption spectroscopy-molecular vibrations, Hooke's law, Selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorption of various functional groups and Interpretation of IR spectra of simple organic compounds. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR, and PMR spectroscopic techniques.	5
UNIT-III	Organometallic Compounds Organomagnesium Compounds The Grignard reagents formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.	5
UNIT-IV	Organosulphur Compounds Nomenclature, structural features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, and sulphonamides.	5

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE -3524.1	Students are skilled in problem solving ,critical thinking and analytical reasoning.
CO2	BCHE -3524.2	After completion of course students should have the ability to identify organic compounds by analysis and interpretation of spectral data.
CO3	BCHE -3524.3	Students should have the ability to explain common terms in NMR spectroscopy such as chemical shift, coupling constant and anisotropy and describe how they are affected by molecular structure.
CO4	BCHE -3524.4	Students are skilled to perform the most commonly used NMR experiments and to interpret and document their results.

Books Recommended:

- 1.Organic Chemistry, F.A Carey, McGraw-Hill, Inc.
- 2.Introduction to Organic Chemistry, Streitwieser, Heathcock and Kosover and Kosover, Macmillan.
- 3.Organic Chemistry, Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd.



(New Age International).

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: PHYSICAL CHEMISTRY-III

SUBJECT CODE: BCHE-3525

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of course :To impart knowledge of basics of spectroscopy & photochemistry.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	<p>Elementary Quantum Mechanics: Black-body radiations, Planck's radiation law, photoelectric effect, heat capacity of solids. Sinusoidal wave equation Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.</p> <p>Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.</p> <p>Spectroscopy: Electromagnetic radiation, regions of spectrum, basic features of different spectrometers, statement of Born-Oppenheimer approximation, degrees of freedom.</p>	20
UNIT-II	<p>Rotational Spectrum : Diatomic molecules. Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity, determination of bond length, qualitative description of non-rigid rotor, isotope effect.</p> <p>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, effect of anharmonic motion and isotope on the spectrum, idea of vibrational</p>	20



	frequencies of different functional groups. Raman Spectrum : Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.	
UNIT-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 σ , π and n M.O.their energy levels and their respective transitions. Solid State: Definition of space lattice and unit cell, Laws of crystallography-(i) Law of constancy of interfacial angles. (ii) Law of rationality of indices (iii) Law of symmetry elements in crystals, X-ray diffraction by crystals. Derivation of Bragg's equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).	10
UNIT-IV	Photochemistry Interaction of radiation with matter, difference between thermal and photochemical process. Laws of photochemistry: Grothus-Drappelaw, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, non- radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions- energy transfer processes (simple examples). Basic concepts of Laser and Maser. Photochemistry of vision and colour	10

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE -3525.1	Able to recognize different regions for different spectroscopy.
CO2	BCHE -3525.2	Able to explain the concept of Electromagnetic Waves.
CO3	BCHE -3525.3	Able to explain the concept use in Black Body Radiation.
CO4	BCHE -3525.4	Able to calculate dipole moment in given molecules.

Books Recommended:

1. Physical Chemistry, R.A Alberty, Wiley Eastern Ltd.
2. The Elements of Physical Chemistry, P. W. Atkins, Oxford.
3. Physical Chemistry Through Problems, S.K. Dogra and S. Dogra, Willey Eastern Ltd.
4. Fundamentals of Photochemistry, Rohtga and Mukherji.

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.



1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: CHEMISTRY LABORTARY-V

SUBJECT CODE: BCHE-3526

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 60

End Term Exam: 40

Duration of Exam: 3 Hrs

Objective of Course: To impart knowledge of synthesis of inorganic & organic compounds.

practices handling laboratory glassware, equipment, and chemical reagents

List of Experiments:

1. Preparation of sodium trioxalatoferrate(III), $\text{Na}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$ and determination of its composition by permagnometry.
2. Preparation of Ni-DMG complex, $[\text{Ni}(\text{DMG})_2]^{2+}$
3. Preparation of copper tetra-ammine complex. $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$
4. Preparation of cis-and trans-bis(oxalato) diaquachromate(III) ion.
5. Synthesis of Iodoform from ethanol and acetone
6. Synthesis of Aromatic electrophilic substitution of benzene, p-nitroacetanilide, 2,4,6-tribromophenol, Diazotization/Coupling
7. Preparation of methyl orange and methyl red
8. Preparation of benzoic acid from toluene
9. Preparation of m-nitroaniline from m-dinitrobenzene

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BCHE -3526.1	How to critically evaluate data collected to determine the identity, purity, and yield of products.
CO2	BCHE -3526.2	How to summarize findings in writing in a clear and concise manner



CO3	BCHE -3526.3	How to use the scientific method to create, test, and evaluate a hypothesis
CO4	BCHE -3526.4	How to engage in safe laboratory

Books Recommended:

1. Vogel's book on Inorganic Qualitative Analysis
2. Vogel's book on Organic Qualitative Analysis

SYLLABUS

SEMESTER-VI



COURSE TITLE: NUCLEAR & PARTICLE PHYSICS

SUBJECT CODE: BPHY-3621

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective of Course: The course aims to provide knowledge of fundamental aspects of the structure of the nucleus, radioactive decay, nuclear reactions, the interaction of radiation and matter and basic fundamental particles of the universe.

Sr. No	Contents	Contact Hours
UNIT I	Nuclear Properties: Constituents of nucleus, non-existence of electrons in nucleus, Nuclear mass and binding energy, features of binding energy versus mass number	15



	curve, nucleus radius, angular momentum and parity, nuclear moments: magnetic dipole moment and electric quadruple moment, properties of nuclear forces, Yukawa theory, Nuclear Models: Liquid drop model, semi-empirical mass formula, condition of stability, evidence for nuclear magic numbers, Shell Model, energy level scheme, angular momenta of nuclear ground states, parity and magnetic moment of nuclear ground states	
UNIT II	Radioactive Decays: Modes of decay of radioactive nuclides and decay Laws, radioactive series and displacement law, radioactive dating, constituents of Cosmic rays, Alpha decay: Gamow's theory of alpha decay, barrier penetration as applied to alpha decay, Geiger Nuttal law, Beta decays: β^- , β^+ and electron capture decays, Neutrino hypothesis and its detection, parity violation in β decay, Gamma transitions: Excited levels, isomeric levels, Gamma transitions, internal conversion	15
UNIT III	Nuclear Reactions: Types of nuclear reactions, reactions cross section, conservation laws, Kinematics of nuclear reaction, Q-value and its physical significance, compound nucleus, level width. Interaction of Nuclear Radiation with matter: Energy loss due to ionization (BetheBlock formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter Basis of detection of nuclear radiations, Gas-filled detectors, proportional and Geiger-Muller counters, Scintillation detectors.	15
UNIT IV	Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3621.1	To cover the topics of nuclear physics and study about their properties
CO2	BPHY-3621.2	Student will gain a clear picture of nuclear composition and various nuclear models
CO3	BPHY-3621.3	Student will have a deep knowledge about Radio activity, radioactivity decays, nuclear Fission and Nuclear Fusion, the relevance of nuclear transformation and nuclear models
CO4	BPHY-3621.4	Student will understand the interactions of charged particles, interaction of photons

Recommended Books:

1. Introduction to Nuclear and Particle Physics by V. K. Mittal, R. C. Verma, and S.C. Gupta
Prentice Hall of India, 2011
2. Introductory nuclear Physics by Kenneth S. Krane, Wiley India Pvt. Ltd., 2008
3. Nuclear Physics D. C Tayal by Himalaya Publication Home, 2007



Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: Electronics

SUBJECT CODE: BPHY-3622

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective of Course: The objective of course is to provide the students with a basic understanding of the physics and principles of operation of the most important semiconductor devices in modern microelectronics and photonics.

Sr. No	Contents	Contact Hours
UNIT I	PN Junction Diode, Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode, Characteristics of PN junction diode, Static and Dynamic Resistance, Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell, Half-wave Rectifiers, Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about filter circuits (LC and π filters)	8
UNIT II	Bipolar Junction transistors: n-p-n and p-n-p Transistors, Characteristics of CB, CE and CC Configurations, Active, Cutoff, and Saturation Regions, Current gains α and β , Relations between α and β , Structure and characteristics of Field Effect Transistor (FET), MOSFET	8
UNIT III	Amplifying action of transistor, Working of CE Amplifier, Voltage divider biasing circuit for CE Ampifier, Amplifier analysis using h-parameter, Equivalent Circuit, Analysis of a single-stage CE amplifier using Hybrid Model, Determination of current gain, power gain, input and output Impedance,	7
UNIT IV	Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations, LC oscillator (tuned collector, tuned base Hartley), RC oscillators, phase shift and Wein bridge. Instrumentations: Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference	7



COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3622.1	Understand the current voltage characteristics of semiconductor devices
CO2	BPHY-3622.2	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation
CO3	BPHY-3622.3	Design and analyze of electronic circuits
CO4	BPHY-3622.4	Evaluate frequency response to understand behavior of Electronics circuits

Books Recommended:

1. Integrated Electronics, J. Millman and C.C. Halkias, Mc-Graw Hill Publication Co. Ltd., 2008
2. Electronics: Fundamentals and Applications, J.D. Ryder, Prentice Hall, 2004
3. Solid State Electronic Devices, B.G.Streetman&S.K.Banerjee, PHI Learning, 2009
4. Principle of Electronics, V K Mehta and Rohit Mehta S Chand & Company, 2012

Instructions to Question Paper Setter: The question paper consist of three sections A, B & C. Section-A is compulsory consisting of short answer type questions (1 or 2 marks) from the whole syllabus. It should be of 12 Marks. Section-B consists of 8 questions and students will attempt any six questions. Each question carries 4 Marks. Section-C consists of 4 questions and Students will attempt any three questions. Each question carries 8 Marks.

COURSE TITLE: GENERAL PHYSICS LAB-VI

SUBJECT CODE: BPHY-3623

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60

End Term Exam: 40

Duration of Exam; 3 Hrs

Objective: The objective of this lab is to highlight to study the properties of light through experiments related to interference, diffraction and polarization

Note: Students will be required to perform at least 12 experiments from the given list of experiments

Contents
1. To study V-I characteristics of PN junction diode, and Light emitting diode.



2. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
3. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
5. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
6. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
7. To V-I characteristic of Solar Cell.
8. Study of half wave, full wave and bridge rectifier.
9. To draw output and mutual characteristics of an FET and determine its parameters.
10. To set up an oscillator and to study its output on CRO for different C-values.
11. To draw the plateau of a GM counter and find its dead time.
12. To study the statistical fluctuations and end point energy of beta particles using GM counter.
13. To study the absorption of beta particles in aluminium using GM counter and determine the absorption coefficient of beta particles from it.
14. To study the response of RC circuit to various input voltage (square, sine and triangular
15 Study of half wave, full wave and bridge rectifier with filter.

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3623.1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO2	BPHY-3623.2	Demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.

Recommended Books:

1. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, Mc-Graw Hill, 2001
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 2000, Prentice Hall.
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 2011, Kitab Mahal
4. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010

SUBJECT TITLE: Dynamics

SUBJECT CODE: BMAT-3621

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective:



The objective of this course is to develop an ability to apply knowledge to analyze motion of a particle with constant acceleration, by a string and along a smooth inclined plane that will help to design a system, component, or process to meet desired needs within realistic constraint.

Course Outcomes:

1. To understand concept of basic concepts of motions under different conditions.
2. To develop an ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams of rigid body
3. Student will be able to analyze the dynamics of rigid body.
4. To learn skills of solving problems related to motion on smooth and rough planes
5. After successful completion of this course students will able to discuss general motion of rigid body relative to a rotating frame of reference

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Motion of a particle with constant acceleration, acceleration of falling bodies, motion under gravity, motion of a body projected vertically upward, Motion of a two particles connected by a string.	10
UNIT-II	Motion along a smooth inclined plane constrained motion along a smooth inclined plane. Variable acceleration, Simple harmonic motion, elastic string, simple pendulum.	10
UNIT-III	Projectile, Work, Power , conservative fields and potential energy, work done against gravity, potential energy of a gravitational field. Relative motion, relative displacement, velocity and acceleration.	10
UNIT-IV	Motion relative to a rotating frame of reference. Linear momentum, angular momentum, conservation of angular momentum, impulsive forces, principle of impulse and momentum.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3622.1	Understand the current voltage characteristics of semiconductor devices
CO2	BPHY-3622.2	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation
CO3	BPHY-3622.3	Design and analyze of electronic circuits
CO4	BPHY-3622.4	Evaluate frequency response to understand behavior of Electronics circuits

Recommended Books:

- 1) S. L. Loney: The elements of statics and dynamics, Cambridge University Press. 2016
- 2) J. L. Synge and B. A. Griffith : Principles of mechanics, Published by Nabu Press.2011

Instruction of Question Paper setter

The paper setter is required to set question paper in three sections A , B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

SUBJECT TITLE: Numerical Methods
SUBJECT CODE: BMAT-3622
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs
Objective:

The course will develop numerical methods aided by technology to solve algebraic, transcendental, and differential equations, and to calculate derivatives and integrals. The course will also develop an understanding of the elements of error analysis for numerical methods and certain proofs. The course will further develop problem solving skills.

Course Outcomes:

1. To understand theoretical and practical aspects of the use of numerical analysis
2. To implement numerical methods for a variety of multidisciplinary applications.
3. Student will be able to establish the limitations, advantages, and disadvantages of numerical analysis
4. To learn skills of applying numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations



5. After successful completion of this course students will be able to understand the use of numerical analysis to obtain approximate solutions to otherwise intractable mathematical problems

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Error: Sources, Propagation and Analysis. Non-Linear Equations: Bisection, Regula-Falsi, Secant, Newton-Raphson, and General Iteration Methods and their convergence, Aitkin's Method for acceleration of the Convergence	10
UNIT-II	Methods for multiple roots, Newton-Raphson and General iteration Methods for System of Non-Linear Equations, Methods for Complex roots and Methods for finding	10
UNIT-III	Roots of Polynomial Equations. Linear System of Equations: Direct Methods: Gauss elimination method, Gauss-Jordan Elimination methods, Decomposition methods : Crout's Methods	10
UNIT-IV	Iterative Methods: Jacobi iterative method, Gauss-Seidel iterative method, Power Method, Householder Method	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3622.1	Understand the current voltage characteristics of semiconductor devices
CO2	BPHY-3622.2	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation
CO3	BPHY-3622.3	Design and analyze of electronic circuits
CO4	BPHY-3622.4	Evaluate frequency response to understand behavior of Electronics circuits

Recommended Books :

1. MK Jain, SRK Iyenger and RK Jain: Numerical Methods for Scientific and Engineering Computations, New Age International (P) Limited, Publishers, New Delhi.2013
2. Kendall E Atkinson: An introduction to Numerical Analysis, John Wiley & Sons, Printed in India by Replika Pvt. Ltd. 2nd Edition, 1989
3. S.S.Sastry: Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi.5th Edition 2012
4. FB Hilderbrand : Introduction to Numerical Analysis, Dover Publication Inc, New York., 2nd Edition 1987

Instruction of Question Paper setter



The paper setter is required to set question paper in three sections A , B and C . Section A consists of 12 MCQs of 1 mark each , Section B consists of 6 Questions with 3 internal choices of 4 marks each and section C consists of 3 questions with 1 internal choice of 8 marks each.

COURSE TITLE: ORGANIC CHEMISTRY-VI

SUBJECT CODE: BCHE-3624

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of Course :To impart knowledge of heterocyclic compounds, polymers, carbohydrates & amino acids..

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	Heterocyclic Compounds: Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reaction in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler- Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.	7
UNIT-II	Synthesis of Polymers: Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers. 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. Alkylation and acylation of enamines.	8
UNIT-III	Carbohydrates: 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 threodiastereomers. Conversion	7



	of glucose into mannose. Formation of glycosides, ethers, and esters. Determination of ring size of monosaccharides. Cyclic structure of D (+)-glucose. Mechanism of mutarotation. Structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharide starch and cellulose without involving structure determination	
UNIT-IV	Amino Acids, Peptides, Proteins and Nucleic Acids Classification, structure and stereochemistry of amino acids. Acid base behaviour, isoelectric point and electrophoresis. Preparation and reactions 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 levels of protein structure. Protein denaturation/renaturation. Nucleic acids: Introduction, Constituents of nucleic acids Ribonucleosides and ribonucleotides. The double helical structure of DNA.	8

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3624.1	The students should be able to demonstrate advanced knowledge and understanding in aspect of protein structure.
CO2	BPHY-3624.2	The students will be able to introduce about basic chemistry of the heterocyclic.
CO3	BPHY-3624.3	The students will get familiar with particular properties and reactions for the most important heterocyclic as well as different systems of nomenclature.
CO4	BPHY-3624.4	The students will develop fundamental theoretical understanding of heterocyclic chemistry

Books Recommended:

- 1.Organic Chemistry, F.A Carey, McGraw-Hill, Inc.
- 2.Introduction to Organic Chemistry, Streitwieser, Heathcock and Kosover and Kosover, Macmillan.
- 3.Organic Chemistry, Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

- 1.Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks.



COURSE TITLE: INORGANIC CHEMISTRY-III

SUBJECT CODE: BCHE-3625

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Objective of Course : To impart knowledge of Transition metal complexes, Bioinorganic chemistry & organometallics.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
UNIT-I	<p>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.</p> <p>Thermodynamic and Kinetic Aspects of Metal Complexes A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.</p>	15
UNIT-II	<p>Magnetic Properties of Transition Metal Complexes Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, Correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moment, application of magnetic moment data for 3d-metal complexes.</p> <p>Electronic Spectra of Transition Metal Complexes. Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d^1 and d^9 states, discussion of electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex.</p> <p>Hard and Soft acids and Bases (HSAB) Classification of acids and bases as a hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.</p>	20
UNIT-III	<p>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.</p>	10
UNIT-IV	<p>Silicones and Phosphazenes: Silicones and Phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.</p> <p>Organometallic Chemistry: Definition, Nomenclature and classification of</p>	15



	organometallic compounds. Preparation, properties, bonding and applications of alkyls, of Li, Al, Hg, Sn and Ti, a brief account of metal-ethylene complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.	
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COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3625.1	Students are able to describe role of different metal ions in biological system
CO2	BPHY-3625.2	Students are able to recognize role of porphyrin ring in haemoglobin.
CO3	BPHY-3625.3	Students are able to count total of electrons in organometallic compound.
CO4	BPHY-3625.4	Students are able to name different organometallic compounds

Books Recommended:

1. D.F.C. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, ELBS Oxford, 1991.
2. J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, 4th Ed, Pearson Education, Singapore, 1999
3. J.D. Lee, Concise Inorganic Chemistry, ELBS, Oxford 1994.
4. Puri Sharma Kalia Principles of Inorganic Chemistry

Instruction of Question Paper setter: The question paper consist of three sections A, B & C.

1. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section.
2. Section-B consists of 8 questions. Students will attempt any six questions. Each question carries 4 Marks.
3. Section-C consists of 4 questions. Students will attempt any three questions. Each question carries 8 Marks

COURSE TITLE: CHEMISTRY LABORTARY-VI

SUBJECT CODE: BCHE-3626

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 60

End Term Exam: 40
Duration of Exam: 3 Hrs

Objective and outcome of Course : To impart knowledge of synthesis

List of Experiments

1. Separation of fluorescein and methylene blue.
2. Separation of leaf pigments from spinach leaves.
3. Determine the strength of the given acid conductometrically using standard alkali solution.
4. To determine the solubility and solubility product of a given sparingly soluble electrolyte conductometrically.
5. To study the saponification of ethyl acetate conductometrically.
6. Determine the ionisation constant of a weak acid conductometrically.
7. To determine the strength of the given acid solution pH- metrically by using standard alkali solution.
8. Determine the molar refraction of methanol, ethanol and propanol.
9. To study the distribution of benzoic acid between benzene and water, and ether and water.
10. Knowledge of Stereochemical Study of Organic Compounds. R and S configuration of optical isomers. E, Z configuration of geometrical isomers
11. Conformational analysis of cyclohexanes and substituted cyclohexanes

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	BPHY-3626.1	Able to understand the separation of components using chromatography.
CO2	BPHY-3626.2	To differentiate the acids and bases on the basis of PH level

Books Recommended:

1. Experiments in Physical Chemistry, R.C. Das, and B. Behra, Tata Mc-graw Hill.
2. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
3. Advanced Exp. Chemistry, Vol. I-Physical, J.N. Gurutu and R. Kapoor, S. Chand & Co.
4. Selected Exp. in Physical Chemistry, N.G. Mukherjee, J.N. Ghose & Sons.
5. Exp. in Physical Chemistry, J.C. Ghosh, Bharti Bhavan.