K.R. MANGALAM UNIVERSITY

THE COMPLETE WORLD OF EDUCATION

SCHOOL OF BASIC AND APPLIED SCIENCES

Bachelor of Science (Honours) Physics

B.Sc. (Hons.) Physics

Programme Code-09

2018-21

Approved in the 17th Meeting of Academic Council Held on 29 June 2018

Academic Council
Member
Secretary
K.R. Mangalam University

Registrar
K.R. Mangalam University
Sohna Road, Gurugram, (Haryana)

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Content

1. Introduction

The K.R. Mangalam Group has made a name for itself in the field of education. Over a period of time, the various educational entities of the group have converged into a fully functional corporate academy. Resources at KRM have been continuously upgraded to optimize opportunities for the students. Our students are groomed in a truly inter-disciplinary environment wherein they develop integrative skills through interaction with students from engineering, management, journalism and media study streams.

The K.R. Mangalam story goes back to the chain of schools that offered an alternative option of world-class education, pitching itself against the established elite schools, which had enjoyed a position of monopoly till then. Having blazed a new trail in school education, the focus of the group was aimed at higher education. With the mushrooming of institutions of Higher Education in the National Capital Region, the university considered it very important that students take informed decisions and pursue career objectives in an institution, where the concept of education has evolved as a natural process.

K.R. Mangalam University was founded in the year 2013 by Mangalam Edu Gate, a company, incorporated under Section 25 of the Companies Act, 1956.

K. R. Mangalam University is unique because of its

i. Enduring legacy of providing education to high achievers who demonstrate leadership in diverse fields.
ii. Protective and nurturing environment for teaching, research, creativity, scholarship, social and economic justice.

Objectives

i. To impart undergraduate, post-graduate and Doctoral education in identified areas of higher education.
ii. To undertake research programmes with industrial interface.
iii. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, exchange & collaborative programmes with foreign, Indian Universities/Institutions and MNCs.
iv. To act as a nodal center for transfer of technology to the industry.
v. To provide job oriented professional education to the pecia student community with particular focus on Haryana.

2. About School

The school imparts out both teaching and research through its various elective science disciplines via Mathematics, Chemistry and Physics.

School of Basic and Applied Sciences imparts students technical knowledge, enhances their skill and ability, motivating them to think creatively, helping them to act independently and take decisions accordingly in all their scientific pursuits and other endeavors. It strives to empower its students and faculty members to contribute to the development of society and Nation.

The faculty is in constant touch with various experts in the relevant field and is willing to experiment with latest ideas in teaching and research.

VISION

School of Basic and Applied Sciences intends for continuum growth as centre of advanced learning, research and innovation by disseminating analytical and scientific knowledge in the areas of basic and applied sciences by promoting interdisciplinary research and scientific acumen.

MISSION

M1: Enable students to be scientists/ academicians /entrepreneurs by accomplishing fundamental and advanced research in diverse areas of basic and applied sciences.

M2: Build strong associations with academic organizations/industries for knowledge creation, advancement, and application of scientific fervor.

M3: Create conducive environment for lifelong learning.

M4: Empower students to be socially responsible and ethically strong individuals through value-based science education.

3. Programmes offered by the School

School offers undergraduate B.Sc. (Hons) Programmes, postgraduate M.Sc. Programmes, and Doctoral Programmes. All these programmes are designed to impart scientific knowledge to the students and are aimed to provide theoretical as well as practical training in their respective fields.

3.1 B. Sc. (Hons.) Chemistry

This course aims to impart basic and applied knowledge in various branches in Chemistry with a view to produce good academics, researchers and professionals in the field.

Eligibility Criteria:- The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board in Science stream with an aggregate of 50% or more.

Course Outline:- Inorganic chemistry / Organic chemistry / Physical chemistry / Analytical methods in chemical sciences / Environmental chemistry / Biochemistry / Green Chemistry.

Career Options:- Opportunities exist in chemical industry, pharmacy, education and forensics.

Programme scheme: - For Programme scheme see Annexure A.

3.2 B.Sc. (Hons.) Physics

Physics, as a stream of study, helps in understanding fundamentals and develop curiosity in understanding various physical aspects of universe. This course aims to impart basic and applied knowledge in physics with a view to produce good academicians, researchers and professionals in varied fields.

Eligibility Criteria: - The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board in Science stream with an aggregate of 50% or more.

Course Outline: - Mathematical Physics / Mechanics / Optics / Thermal Physics / Oscillations & Waves / Electricity & Magnetism / Numerical Analysis / Digital Electronics / Microprocessor & Computer Programming / Digital Electronics / Quantum Mechanics / Atomic & Molecular Physics / Electronic Devices / Electromagnetic Theory / Statistical Physics / Solid State physics / Nuclear
& Particle Physics.

Career Options: - Opportunities exist in academics, research laboratories and administration besides all the opportunities applicable to any other graduate like UPSC examination's, defence services and other govt. jobs.

Programme scheme: - For Programme scheme see Annexure B.

3.3 B.Sc. (Hons.) Mathematics

Mathematics is a universal part of human culture. This course aims to impart basic and applied knowledge in Mathematics with a view to produce good Mathematicians and researchers. A degree in mathematics provides you with a broad range of skills in problem solving, logical reasoning and flexible thinking.

Eligibility Criteria: - The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board in Science stream with an aggregate of 50% or more.

Course Outline: - Calculus / Vector Calculus / Business Mathematics / Differential Equations / Solid Geometry / Computer Programming / Modern Algebra / Numerical Analysis / Linear Algebra
/ Real Analysis / Complex Analysis / Probability and Statistics / Operational research / Mechanics.

Career Options: - Mathematicians work in business, finance, industry, government offices, management, education and science.

Programme scheme: - For Programme scheme see Annexure C.

4 Programme Duration

The minimum period required for the B.Sc. (Hons.) Programme offered by the University shall extend over a period of three Academic Years.

The maximum period for the completion of the B.Sc. (Hons) Programme offered by the University shall be five years.

5 Class Timings

The classes will held from Monday to Friday from 09:10 am to 04:10 pm.

6 Scheme of Studies and Syllabi

The syllabi of all courses programme offered by SBAS are given in the following pages. These are arranged as: (a) common courses (b) degree specific courses, in numeric order of the last three digits of the course code.

For each course, the first line contains; Course Code and Credits (C) of the course. This is followed by the course objectives, syllabus (Unit I to IV), Text book and reference books.

6.1 Syllabi of Common Courses in all B.Sc. (Hons.) Programme

BSEL 101 COMMUNICATION SKILLS (Credits-4)

Course Objectives:

The purpose of this course is to understand the basics of Grammar to improve written and oral communication and to speak correct form of English with proficiency in which will improve students' personality and enhance their self-confidence

UNIT I

Introduction to Communication: Meaning, Forms & Types of Communication; Process of Communication; Principles of Effective Communication/7Cs, Barriers in Communication; Literature: A Bird Came Down the Walk by Emily Dickinson

UNIT II

Essentials of Grammar: Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection; Using tenses; Articles; Types of sentences; Reported Speech; Punctuation; Literature: Stopping by Woods on A Snowy Evening by Robert Frost

UNIT III

Building Vocabulary: Word Formation (by adding suffixes and prefixes); Common Errors; Words Often Confused; One word substitution, Homonyms and Homophones; Antonyms &Synonyms, Phrasal Verbs, Idioms & Proverbs (25 each); Commonly used foreign words(15 in number); Literature: The Last Leaf by O'Henry

UNIT IV

Personality Development: Etiquette & Manners; Leadership; Inter & intra personal skills; Attitude, Self-esteem & Self-reliance; Public Speaking; Body Language: Posture, Gesture, Eye Contact, Facial Expressions; Presentation Skills/ Techniques; Literature: My Prayer to Thee by Rabindranath Tagore;

TEXT BOOK:

1. Kumar, Sanjay and Pushplata.CommunicationSkills.Oxford University Press.

REFERENCE BOOKS / SITES:

1. Tickoo, M.L, Subramanian A. E. and Subramaniam P.R. Intermediate Grammar, Usage and Composition. Orient Blackswan.
2. Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press.
3. "Best Poems", http://100.best-poems.net/. 20 July 2016.
4. "Classic English Short Stories" ,http://www.eastoftheweb.com/short-stories/Collections/ ClasEngl.shtml, 20 July 2016.

BSCS 113 INTRODUCTION TO COMPUTERS AND PROGRAMMING (Credits-3)

Course Objectives:

The objective of the course module is to

- Introduce basics of Computers and its architecture.
- Understand the concepts of Programming using C.

UNIT-I

Introduction to Computer and Programming: Overview of Computer organization and historical perspective computer applications in various fields of science and management. Data representation: Number systems, character representation codes, binary, hex, octal codes and their inter conversions, ASCII, EBCDIC, gray code Binary arithmetic, floating-point arithmetic, signed and unsigned numbers. Concept of algorithms, flow charts, data flow diagrams etc., Concepts of the finite storage, bits bytes, kilo, mega and gigabytes; Concepts of character representation.

UNIT-II

Programming using C: Example of some simple C program. Concept of variables, program statements and function calls from the library (print for example) C data types, int, char, float etc., C expressions, arithmetic operation, relational and logic operations, C assignment statements, extension of assignment of the operations. C primitive input output using getchar and putchar, exposure to the scan and print functions, C Statements, conditional executing using if, else. Optionally switch and break statements may be mentioned.

UNIT-III

Iterations and Sub programs: Concept of loops, example of loops in C using for, while and do

-while. Optionally continue may be mentioned.

One dimensional arrays and example of iterative programs using arrays: 2-d arrays, use in matrix computations; Concept of Sub-programming, functions Example of functions; Argument passing mainly for the simple variables.

UNIT-IV

Digital: Binary representation of decimal number, Octal and Hexadecimal representation, BCD, Signed and Unsigned representation, One's and two's complement, Boolean Algebra, De- Morgan's Law, Logic Gates etc.

TEXT BOOKS

1. Y. Kanetkar, Let us C, BPB Publications.

REFERENCE BOOKS:

1. Herbert Scheldt, C: The complete reference, Osbourne McGraw Hill.
2. Rajaraman, Fundamentals of Computers, Prentice Hall of India.
3. Morris Mano, Digital Design, Pearson's publications.
4. Kernighan & Ritchie, C Programming Language, the (ANSI C Version), Prentice Hall of India.
5. J. B. Dixit, Fundamental of Computers and Programming in C, Laxmi Publications, New Delhi.

BSCH 125 ENVIRONMENTAL STUDIES (Credits-3)

Course Objectives:

This course in environmental studies will develop the

- Basic understanding about the concept related to environment such as eco system and biodiversity.
- Understanding about pollution and its control.
- Insight about the various concerns regarding environment such as population and social
  issues.

UNIT-I

Introduction of Environmental Studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.

Natural Resources: Renewable and Non-renewable Resources

Land resources: land use change; Land degradation, soil erosion and desertification.

Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT-II

Ecosystems: Definition and Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession.
Case studies of the following ecosystems:

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biological Diversity: Levels of biological diversity; genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; India as

a mega-biodiversity nation; Endangered and endemic species of India; Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity; Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT-III

Environmental Pollution: Types, causes, effects and controls; Air, water, soil and noise pollution. Nuclear hazards and human health risks; Solid waste management: Control measures of urban and industrial waste; Pollution case studies.

Environmental Policies and Practices: Climate change, global warming, ozone layer depletion,
acid rain and impacts on human communities and agriculture.

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection

Act; Forest Conservation Act; Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. International agreements: Montreal &Koyoto protocol and convention on biological diversity. Nature reserves, tribal population and rights, human wild life conflicts in Indian context.

UNIT-IV

Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare; Resettlement and rehabilitation of project affected persons; case studies; Disaster management: floods, earthquake, cyclones and landslides; Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan; Environmental ethics: Role of Indian and other religions and cultures in environmental conservation; Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Field work:

Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
Study of common plants, insects, birds and basic principles of identification.
Study of simple ecosystems-pond, river, Delhi Ridge, etc.

TEXT BOOKS:

1. Erach Bharucha, Textbook of Environmental Studies, Universities Press (P) Ltd., Hyderabad, India
2. Anubha Kaushik and C. P. Kaushik, Environmental Studies, New Age International, New Delhi.

REFERENCE BOOKS:

1. A.K. De, Environmental Chemistry, New Age International, New Delhi.
2. P. H. Raven, D. M. Hassenzahl & L. R. Berg, Environment, John Wiley & Sons, New Delhi.
3. J. S. Singh, S. P. Singh and S. R. Gupta, Ecology, Environmental Science and Conservation, S. Chand Publication, New Delhi.

BSCS 157 C PROGRAMMING LAB (Credits-1)

List of Experiments

1. Write a program to find the largest number out of five numbers (ternary operator)
2. Write a program to find roots of quadratic equation using functions.
3. Write a C program to check whether a given year is leap year or not.
4. Write a C program to check whether a given number is prime or not, also check whether it is divisible by a number k or not.
5. Write a C program to take marks of a student as input and print the his/her grade bases on following criteria using if —else statements
   Marks <40 Fail
   40<= Marks <59 Good
   59 <= Marks < 80 Excellent 80 <= Marks Outstanding
6. Perform experiment 7 using switch case statement.
7. Write a C program to concatenate two strings.
8. Write a program using arrays to find the largest and second largest number out of given 10 numbers using bubble sort.
9. Write a program to multiply two matrices

10. Write a program to reverse a string.
11. Write a program to concatenate two strings
12. Write a program to calculate the length of the string.
13. Write a program to find factorial of a number using function.

Note: - Any 10 experiments will be performed.

BSEL 171 COMMUNICATION SKILLS LAB (Credits-1)

Course Objectives:
The Communication Skills Lab focuses on communication activities in functional and situational contexts. It encourages students to speak with fluency and accuracy as well as to enhance the four language skills of reading, writing, listening and speaking through real life and professional situations.

In each practical class student should spend

- 5 to 10 minutes on effective browsing of online News paper
- 5 to 10 minutes on English Language software activities

Each student must actively complete the following ten activities in practical classes, and the Lab Record with the teacher's signature and the internal marks should be submitted to the External Expert during Viva.

Activity 1: Self - introduction: Informal introduction & formal introduction; A detailed write up on formal 'Self Introduction'; Formal Introduction of oneself in front of the group.

Activity 2 : News Reading: Introduction to 'online News papers'; Browsing and selecting the preferred News paper; Browsing through the News Headlines; Selecting interested News items; Comprehending the content, writing down the essence and reading the News in front of the Group. Discuss 5 to 8 new words or terms, 4 to 5 important personalities of that day's news etc.

Activity 3: a. JAM: Introduction to 'Just A Minute speech' and the 'Extempore speech'; Preparation of speech on given topic(different topic for each student); delivery of the speech; Feed back(on
content, time management, body language etc. highlighting the positive aspects first.)
b. Listening Comprehension: Listen to online / downloaded oration by renowned Orators; write down the content in a precise form and give an oral presentation of that write up following all the etiquettes of public speaking.

Activity 4: a. Turn Coat: Speaking for and against by the same person with time specification; assign topics from the immediate surroundings; write down the contenteitherfrom the Net or from personal knowledge; prepare well and deliver; feedback & suggestions for improvement.

b. News Discussions: Selecting News of the day, Discussing among the group, prepare the news content and prepare the group opinion about the issue and present it in front of the class by the group involving each member; select 5 new words & new usages from the selected news item

Activity 5: Conversation ability: Characteristics of effective conversation; Listening to a few sample conversations; preparing conversation based on the given situation; enacting the situation through effective delivery of the script; feedback & suggestions for improvement.

Activity 6: Role Play: Characteristics of Role Play; assigning roles; developing the content to
deliver; enacting the role with effective delivery; feedback & suggestions for improvement.

Activity 7: Public Speaking: Characteristics of effective Public speaking; possible barriers; watching demo online; topic assignment, information gathering & recording; delivery in front of the class; feedback & suggestions for improvement.(Different topic for each student)

Activity 8: Group Discussion: Importance and characteristics; Dos & Don'ts in GD; Demo display; assign topic for the group, Preparation & performance; feedback & suggestions for improvement.

Activity 9: Debate: Difference between Group Discussion & Debating; Watching demo of Debating; Topic for the group of 2 or 4; preparation and performance; feedback & suggestions for improvement.

Activity 10: Interview: Importance & purpose of Job Interview; Interview etiquettes; Watch demo interview; Appear for formal mock interview; feedback & suggestions for improvement.

TEXT BOOK:

1. Kumar, Sanjay and Pushplata.CommunicationSkills.Oxford University Press.

REFERENCE BOOKS:

1. Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press.
2. Raman Meenakshi& Sharma, Sangeetha. Technical Communication Principles and Practices, 2nd Ed. Oxford University Press, New Dehi, 2011.

BSMA 131 DATA PRESENTATION FOR SCIENCES (Credits-1)

Using Excel, create documents that highlight:

1) Scaling in size. Rounding numbers.
2) Graphing simple data. Bar graphs (2D and 3D). Pie Charts.
3) Absolute and Relative references. Effects on data visualizations when references aren't properly used.
4) Using Functions. SUM, AVERAGE, MEDIAN, SQRT, and other simple one variable functions.
5) Using Conditional statements. IF, AND, OR.
6) Creating Scatterplots. Showing correlation and regression for two variables, and higher number of variables.
7) Using Filters. Pivot tables. Freezing panes.
8) Linking sheets using VLOOKUP and HLOOKUP.

Using PowerPoint, create presentations that highlight:

9) Standard format, font, transitions (illustrating negatives of too many variations). **Using Presenter view in Powerpoint. Multiple notes to be displayed**.
10) Embedding a functioning Excel sheet into a PowerPoint slide.
11) Embedding your own videos, videos from the internet (such as from YouTube), and embedding GIFs.
12) Mathematics Formulae in PowerPoint.
13) Creating personalized templates.
14) Animations and creating animated GIFS using PowerPoint.

6.2 Syllabi of Common Courses in B.Sc. (Hons.) Chemistry and Physics

BSMA 141 MATHEMATICS —I (Credits-4)

Course Objectives: The subject matter incorporated in this course will enable students to

- Acquire knowledge regarding differential equation and numerical analysis.
- Understand the fields of matrix, differential calculus and integral calculus.

UNIT-I

Recapitulation: Fundamentals, Mathematical functions, polynomial expressions, logarithmic and exponential function, Trigonometric functions, equation of a straight line, plotting graphs. Mathematical series: Power series, Maclaurin, Taylor series.

Numerical Methods: Roots of quadratic equations analytically and iteratively; Numerical methods of finding roots (Bisection, Regular-Falsi, Secant, Newton-Raphson).

UNIT-II

Differential calculus: limiting values of functions: L' Hôspital's rule, the tangent line and the derivative of a function, numerical differentiation, higher order derivatives, maximum-minimum problems, inflexion points.

UNIT-III

Integral calculus: The process of integration, odd and even functions, indefinite integrals, methods of integration, numerical integration.

UNIT-IV

Calculus with several independent variables: Functions of several independent variables, change of variables, relations between partial derivatives, total differentials, and chain rules for partial different ion, Euler's theorem.

TEXT BOOK:

1. H. K. Dass, Higher Engg. Mathematics, S. Chand.

REFERENCE BOOKS:

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engg. Computation, New age International, New Delhi.
2. Shanti Narayan, Integral calculus, Sultan Chand & Co., New Delhi.
3. Shanti Narayan, Differential calculus Sultan Chand & Co., New Delhi.

6.3Syllabi of Courses specific to B.Sc. (Hons.) Physics

BSPH 101 MATHEMATICAL PHYSICS – I (Credits-5)

Course Objectives:

Study of the topics included in this course will enable the students to:-

- Develop the mathematical methods for application to problems in physics.
- Gain the insight of vector calculus.
- Learn the calculations of errors.

UNIT- I

Vector Differentiation: Scalar and Vector Fields, Ordinary and Partial Derivative of a Vector w.r.t. Coordinates; Unit Tangent Vector and Unit Normal Vector; Directional Derivatives and Normal Derivative; Gradient of a Scalar Field and its Geometrical Interpretation; Divergence and Curl of a Vector Field; Del and LaplacianOperators; VectorIdentities.

UNIT- II

Vector Integration: Ordinary Integral of Vectors; Line, Surface and Volume Integrals; Flux of a Vector Field; Gauss' Divergence Theorem, Green's Theorem and Stokes Theorem.

Orthogonal Curvilinear Coordinates: Orthogonal Curvilinear Coordinates; Derivation of Gradient, Divergence; Curl and Laplacian in Cartesian; Spherical and Cylindrical Coordinate Systems.

Multiple Integrals: Double and Triple Integrals: Change of Order of Integration, Change of Variables and Jacobian. Applications of Multiple Integrals: (1) Area EnclosedbyPlaneCurves,(2)AreaofaCurvedSurface,(3)VolumesofSolids

UNIT- III

Some Special Integrals: Beta and Gamma Functions and Relation between them, Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral).

Theory of Errors: Systematic and Random Errors; Propagation of Errors; Normal Law of Errors; Standard and Probable Error.

UNIT - IV

Fourier Series: Dirichlet Conditions (Statement only); Kronecker's Method for Computation of Fourier Coefficients, Even and Odd Functions; Orthogonality of Sine and Cosine Functions, Sine and Cosine Series. Applications: Square Wave, Triangular Wave, Output of Full Wave Rectifier and other Simple Functions; Summing of Infinite Series Term-by-Term Differentiation and Integration of a Fourier series.

TEXT BOOK:

1. H. K. Dass & R. Verma, Higher Mathematical Physics, S. Chand.

REFERENCE BOOKS:

1. Satya Prakash, Mathematical Physics, S. Chand.
2. Murray Spiegel, Seymour Lipschutz Schaum's Outline of Vector Analysis, McGraw Hill Education Private Limited, India.
3. D. E. Bourne, P C Kendall, Vector Analysis and Cartesian Tensors, Chapman and Hall, New York.
4. Murray R. Spiegel, Schaum's Outline of Theory and Problems of Fourier Analysis, McGraw Hill Education Pvt. Ltd., India.
5. Erwin Kreyszig; Advanced Engineering Mathematics; (Wiley Eastern Limited).
6. Charlie Harper; Introduction to Mathematical Physics; PHI LEARNING Pvt. Ltd., New Delhi.
7. B S Grewal; Higher Engineering Mathematics; Khanna Publishers, New Delhi.

BSPH 107 MECHANICS (Credits-5)

Course Objectives:

The topics included in this course will help students to:-

- Understand the behavior of physical bodies when subjected to forces or displacements.
- Understand the subsequent effects of the bodies on their environment.
- Understand the inertial and non-inertial frames of references.

UNIT-I

Fundamentals of Dynamics: Dynamics of a System of Particles, Centre of Mass; Conservation of Momentum: Idea of Conservation of Momentum from Newton's Third Law: Impulse, Momentum of Variable. Mass System: Motion of Rocket.

Work and Energy Theorem: Work and Kinetic Energy Theorem; Conservative and Non-Conservative Forces; Potential Energy, Energy Diagram; Stable and Unstable Equilibrium; Gravitational Potential Energy. Force as Gradient of Potential Energy; Work and Potential energy; Law of Conservation of Energy; Elastic and Inelastic Collisions between particles.

UNIT-II

Rotational Dynamics: Angular Momentum of a Particle and System of Particles; Torque, Conservation of Angular Momentum; Rotation about a Fixed Axis; Moment of Inertia: Calculation of Moment of Inertia for Rectangular, Cylindrical, and Spherical Bodies: Kinetic Energy of Rotation, Motion involving both Translation and Rotation.

Gravitation: Law of gravitation. Inertial and Gravitational Mass. Potential and Field due to Spherical Shell and Solid Sphere.

UNIT- III

Central Force Motion: Motion of a Particle under Central Force Field. Two Body Problem and its Reduction to One Body Problem and its Solution; The Energy Equation and Energy Diagram; Kepler's Laws (Ideas Only); Orbits of Artificial Satellites.

Elasticity: Relation between Elastic Constants; Twisting Torque on a Cylinder or Wire.

Fluid Motion: Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.

UNIT- IV

Inertial and Non- Inertial Systems: Reference Frames; Galilean Invariance and Conservation Laws; Non-inertial Frames, Uniformly Rotating Frame; Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems.

Special theory of Relativity: Michelson-Morley Experiment and its Outcome;

Postulates of Special Theory of Relativity; Lorentz Transformations, Lorentz Contraction, Time Dilation; Relativistic Transformation of Velocity, Frequency and Wave Number, Relativistic Addition of Velocities; Variation of Mass with Velocity; Rest Mass, Massless Particles, Mass-energy Equivalence; Relativistic Doppler Effect; Relativistic Kinematics;Transformation of Energyand Momentum.

TEXT BOOK:

1. D. S. Mathur, Mechanics, S. Chand.

REFERENCE BOOKS:

1. Daniel Kleppner, Robert J. Kolenkow, An Introduction to Mechanics (McGraw-Hill), Berkeley, U.S.
2. Charles Kittel, Walter Knight, Malvin Ruderman, Carl Helmholz, Burton Moyer, Mechanics Berkeley physics course, V.1, (Tata McGraw-Hill), Berkeley, U.S.
3. D. S. Mathur, Mechanics, S. Chand & Co. Ltd., New Delhi.
4. Keith R. Symon, Mechanics (Addison Wesley), Boston, USA.
5. F. W. Sears, M. W. Zemansky and H. D. Young, University Physics, Narosa Publishing House, New Delhi.

BSPH 105 OPTICS (Credits-5)

Course Objectives:

The subject matter incorporated in this course will enable students to:-

- Understand the behavior and properties of light.
- Acquire knowledge about the interference & diffraction.

UNIT- I

Geometrical Optics: Fermat's Principle: Optical Path; Fermat's Principle of Least Time or Extremum Path; Examples of Fermat's Principle: (1) Reflection and (2) Refraction.

Lenses: Transverse Magnification of a Spherically Refracting Surface, Lagrange and Helmholtz Laws of Magnification; Cardinal Points of a Coaxial Optical System. Graphical Construction of Image using Cardinal Points; Deviation produced by a Thin Lens. Equivalent Focal Length of Two Thin Lenses separated by a distance; Cardinal Points of a Coaxial System of Two Thin Lenses: Thick Lenses, Focal Length of a Thick Lens, Variation of Focal Length of a Convex Lens with Thickness, CardinalPointsofaThick Lens.

UNIT- II

Wave Optics: Nature of Light: Theories of Light, Electromagnetic Nature of Light; Definition of a Wave Front, Propagation of a Wave Front; Huygens Principle of Secondary Wavelets.

Interference: Division of Amplitude and Division of Wave front. Young's Double Slit Experiment; Loyd's Mirror and Fresnel's Biprism. Interference in Thin Films: Parallel and Wedge-shaped Films. Newton's Rings: Measurement of Wavelength and Refractive Index.

Michelson's Interferometer: (1) Determination of Wavelength, (2) Wavelength Difference, (3) Refractive Index.

Coherence: Temporal and Spatial Coherence, Theory of Partial Coherence, Coherence Time and Coherence Length; Purity of a Spectrum Line.

UNIT- III

Diffraction: Fresnel diffraction: Fresnel's Assumptions. Fresnel's Half-Period Zones for Plane Wave; Explanation of Rectilinear Propagation of Light; Comparison of a Zone plate with a Convex lens; Diffraction due to (1) a Straight Edge and (2) a Rectangular Aperture (Slit), (3) a Small Circular Aperture and (4) an Opaque Circular Disc. Fresnel's Integrals, Cornu's Spiral: Fresnel Diffraction Pattern due to (1) a Straight Edge, (2) a Slit.

UNIT- IV

Fraunhofer diffraction: Diffraction due to (1) a Single Slit, (2) a Double Slit and (1) a Plane Transmission Grating; Rayleigh's criterion of resolution; Resolving Power and Dispersive Power of a Plane Diffraction Grating.

Holography: Principle of Holography; Recording and Reconstruction Method; Theory of Holography as Interference between two Plane Waves.

TEXT BOOK:

1. N. Subrahmanyam, B. Lal & M. N. Avdhanulu, Optics, S. Chand

REFERENCE BOOKS:

1. Francis Arthur, Jenkins and Harvey Elliott White, Fundamentals of Optics (McGraw-Hill), New York.
2. A. Ghatak, Optics, Tata McGraw Hill, New York.
3. Eugene Hecht and A. R. Ganesan, Optics (Pearson Education), New Delhi.
4. Abdul Al-Azzawi Light and Optics: Principles and Practices (CRC Press), U.S.
5. A. K. Ghatak & K. Thyagarajan, Contemporary Optics, Plenum Publishing Corporation, New York.
6. Khanna and Gulati, Introduction to Optics, R. Chand & Co., Delhi.

BSPH 153 BASIC PHYSICS LAB – I (Credit-1)

LIST OF EXPERIMENTS

1. To plot a graph between the distance of the knife edge from the centre of gravity and the time period of the bar pendulum. From the graph, find
   (i) the acceleration due to gravity,
   (ii) the radius of gyration and the moment of inertiaof the bar about an axis.
2. To determine the moment of inertia of a flywheel about its own axis of motion.
3. To determine the value of acceleration due to gravity using Kater's pendulum.
4. To determine the frequency of A.C. mains with sonometer using non- magnetic wire.
5. To determine the frequency of electrically matained turning fork by Melde`s method.
6. To determine the wavelength of sodium light using Newton`s ring apparatus.
7. To determine the wavelength of prominent lines of mercury by plane diffraction grating.
8. To determine the refractive index of the material of the prism for the given colours (wavelengths) of mercury light with the help of spectrometer.
9. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
10. To determine the wavelength of He-Ne LASER using transmission diffraction grating.

REFERENCE BOOKS:

1. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes (Vani Publication House, New Delhi).
2. B. L. Worsnop, H. T. Flint, Advanced Practical Physics (Asia Publishing House, New Delhi).
3. GeetaSanon, B.Sc Practical Physics (R. Chand & Co).
4. C. L.Arora, B.Sc Practical Physics (S Chand and Co. Ltd., New Delhi).
5. InduPrakash, Ramakrishna, A Text Book of Practical Physics (Kitab Mahal, New Delhi).

(Note: A candidate has to perform at least eight experiments in the lab. Any suitable experiment may be added.)

BSPH 102 MATHEMATICAL PHYSICS –II (Credits-5)

Course Objectives:

Study of the topics included in this course will enable the students to:-

- Develop the mathematical methods for application to problems in physics.
- Understand the differential equations and calculus of variations.

UNIT -I

Differential Equations: Classification: Ordinary and Partial, Order and Degree, Linear and Nonlinear, Homogeneous and Non homogeneous. Solution: Explicit and Implicit, Number of Arbitrary Constants.

Linear Ordinary Differential Equations: First order: (1) Separable Equations; Initial Value Problem. (2) Exact Equations; Integrating Factor. (3) Linear Equations. Lagrange's MethodofVariationofParameters.

UNIT -II

Second order: Homogeneous Equations with Constant Coefficients: Wronskian and General Solution, Statement of Existence and Uniqueness Theorem for Initial Value Problems. Solution of Non-homogeneous Equations by D Operator Method, Particular Integral; Methods of Undetermined Coefficients and Variation of Parameters; Equations Reducible to those with Constant Coefficients; Bernoulli and Euler Equations.

UNIT -III

Differential Equations of special types: solutions of differential equations of successive integration, equations which do not contains x or y variables directly, equation whose one solution is known normal form (removal of first derivative), solution of linear differential equation by method of changing of variables, method of variation of parameters, Coupled Differential Equations

UNIT-IV

Applications of Differential Equations: Electrical engineering problems, Mechanical engineering Problems: rectilinear motions, vertical & Horizontal elastic string, Simple harmonic motion, damped harmonic motion, forced harmonic motion, bending of beam, projectiles.

TEXT BOOK:

1. H. K. Dass & R. Verma, Higher Mathematical Physics, (S. Chand.)

REFERENCE BOOKS:

1. N. M. Kapoor, A Text Book of Differential Equations, (Pitambar Publishing)
2. Richard Bronson, Schaum's outline of theory and problems of differential equations (McGraw-Hill Professional)
3. Erwin Kreyszig, Advanced Engineering Mathematics, (Wiley Eastern Limited)
4. B. S. Grewal, Higher Engineering Mathematics, (Khanna Publishers)

BSPH 112 ELECTRICITY & MAGNETISM (Credits-5)

Course Objectives:

The subject matter incorporated in this course will help students to

- Understand the concept of electric field & potential.
- Learn the dielectric properties of matter.
- Learn the magnetic properties of matter.

UNIT- I

Electric Field: Electric Field & Lines. Electric Field E due to a Ring of Charge; Electric Flux; Gauss's law, Gauss's law in Differential form,Applications of Gauss's Law : E due to (1) an Infinite Line of Charge, (2) a Charged Cylindrical Conductor,

(3) an Infinite Sheet of Charge and Two Parallel Charged Sheets, (4) a Charged Spherical Shell, (5) a Charged Conducting Sphere, (6) a Uniformly Charged Sphere, (7) Two Charged Concentric Spherical Shells and (8) a Charged Conductor.

Electric Potential: Line Integral of Electric Field; Electric Potential Difference and Electric Potential V (Line integral); Conservative Nature of Electrostatic Field; Relation between E and V; Electrostatic Potential Energy of a System of Charges; Potential and Electric Field of (1) a Dipole, (2) a Charged Wire and (3) a Charged Disc. Force and Torque on a Dipole; Conductors in an Electrostatic Field. Method of Images and its Application to:- (1) Plane Infinite Sheet and (2) Sphere.

UNIT- II

Electrostatic Energy of (1) a Point Charge, (2) a System of Point Charges, (3) a Uniform Sphere, (4) a Capacitor.

Dielectric Properties of Matter

Dielectrics: Electric Field in Matter, Dielectric Constant; Parallel Plate Capacitor with a Dielectric; Polarization; Polarization Charges and Polarization Vector; Electric Susceptibility; Gauss's law in Dielectrics; Displacement vector D; Relations between the three Electric Vectors. Capacitors filled with Dielectrics.

UNIT -III

MagneticField

Magnetic Effect of Currents: Magnetic Field B, Magnetic Force between Current Elements and Definition of B. Magnetic Flux; Biot-Savart's Law : B due to

(1) a Straight Current Carrying Conductor and (2) Current Loop, Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole); Ampere's Circuital law (Integral and Differential Forms): B due to (1) a Solenoid and (2) a Toroid; Properties of B; Curl and Divergence of B. Vector Potential.

Forces on an Isolated Moving Charge; Magnetic Force on a Current Carrying Wire. Torque on a Current Loop in a Uniform Magnetic Field.

UNIT- IV

Magnetic Properties of Matter

Magnetism of Matter: Gauss's law of magnetism (Integral and Differential Forms); Magnetization current; Relative Permeability of a Material; Magnetic Susceptibility, Magnetization Vector (M). Magnetic Intensity (H); Relation between B, M and H; Stored Magnetic Energy in Matter; Magnetic Circuit; B-H Curve and Energy Loss in Hysteresis.

Electromagnetic induction

Faraday's law (Differential and Integral forms); Lenz's Law; Self and Mutual Induction; Energy stored in a Magnetic Field.

Ballistic Galvanometer

Potential Energy of a Current Loop; Ballistic Galvanometer: Current and Charge sensitivity;ElectromagneticDamping;LogarithmicDamping;CDR.

TEXT BOOK:

1. K. K. Tiwari, Electricity and Magnetism, S. Chand & Co., Delhi.

REFERENCE BOOKS:

1. Edward M. Purcell, Electricity and Magnetism, McGraw-Hill Education, Berkeley, U.S.
2. Arthur F. Kip, Fundamentals of Electricity and Magnetism, McGraw-Hill, Berkeley, U.S.
3. J.H. Fewkes & John Yarwood, Electricity and Magnetism.Vol.I, Oxford Univ. Press.
4. D C Tayal, Electricity and Magnetism. (Himalaya Publishing House).
5. David J. Griffiths, Introduction to Electrodynamics, Benjamin Cummings.

BSPH 106 OSCILLATIONS & WAVES (Credits-5)

Course Objectives:

The subject matter incorporated in this course will help students to

- Learn about the Simple Harmonic Oscillation and its solution.
- Understand the different wave's phenomenon.

UNITI

Oscillations: SHM: Simple Harmonic Oscillations; Differential Equation of SHM and its Solution, Amplitude, Frequency, Time Period and Phase; Velocity and Acceleration; Kinetic, Potential and Total Energy and their Time Average Values; Reference Circle; Rotating Vector Representation of SHM.

Free Oscillations of Systems with One Degree of Freedom: (1) Mass-Spring system, (2) Simple Pendulum, (3) Torsional Pendulum, (4) Oscillations in a U-Tube, (5) Compound pendulum: Centres of Percussion and Oscillation, and (6) Bar Pendulum.

UNIT II

Superposition of Two Collinear Harmonic Oscillations: Linearity and Superposition Principle.(1) Oscillations having Equal Frequencies and (2) Oscillations having Different Frequencies (Beats); Superposition of N Collinear Harmonic Oscillations with

(1) Equal Phase Differences and (2) Equal Frequency Differences.

Superposition of Two Perpendicular Harmonic Oscillations: Superposition of Two Mutually Perpendicular Simple Harmonic Motions with Frequency Ratios 1:1 and 1:2 using Graphical and Analytical Methods; Lissajous Figures and their Uses.

UNIT III

System with Two Degrees of Freedom: Coupled Oscillators, Normal Coordinates and Normal Modes; Energy Relation and Energy Transfer; Normal Modes of N Coupled Oscillators.

Free Oscillations; Damped Oscillations: Damping Coefficient, Log Decrement; Forced Oscillations: Transient and Steady States, Amplitude, Phase, Resonance, Sharpness of Resonance, Power Dissipation and Quality Factor; Helmholtz Resonator.

UNIT- IV

Waves: Wave Motion: Plane and Spherical Waves, Longitudinal and Transverse Waves; Plane Progressive (Travelling) Waves; Wave Equation; Particle and Wave Velocities; Differential Equation; Pressure of a Longitudinal Wave; Energy Transport; Intensity of Wave. Water Waves: Ripple and Gravity Waves.

Velocity of Waves: Velocity of Transverse Vibrations of Stretched Strings; Velocity of Longitudinal Waves in a Fluid in a Pipe; Newton's Formula for Velocity of Sound; Laplace's Correction. Superposition of Two Harmonic Waves: Standing (Stationary) Waves in a String: Fixed and Free Ends; Analytical Treatment; Phase and Group Velocities.

TEXT BOOK:

1. M. Ghosh, D. Bhattacharya, A Text Book of Oscillations, Waves and Acoustics, S. Chand & Co. Pvt. Ltd., Delhi.

REFERENCE BOOKS:

1. P. French, Vibrations and Waves, CBS Pub.& Dist., New Delhi.
2. N.K. Bajaj, The Physics of Waves and Oscillations, Tata McGraw-Hill, New Delhi.
3. K. Uno Ingard, Fundamentals of Waves & Oscillations, Cambridge University Press.
4. Daniel Kleppner, Robert J. Kolenkow, An Introduction to Mechanics, McGrawHill, U.S
5. Franks Crawford, Waves: Berkeley Physics Course (SIE), Tata McGraw-Hill, U.S.

BSMA 224 BASICS OF MATLAB (Credits-2)

Course Objectives:

- Understand the MATLAB Desktop, Command window and the Graph Window.
- Be able to do simple and complex calculation using MATLAB.
- Be able to carry out numerical computations and analyses.
- Understand the mathematical concepts upon which numerical methods rely.
- Ensure you can competently use the MATLAB programming environment.
- Understand the tools that are essential in solving engineering problems.

UNIT I

Introduction to MATLAB: Starting and ending MATLAB session, MATLAB environment, MATLAB help, types of files, search path, some useful MATLAB commands, data types, constant and variables, Operators, built-in functions, assignment statement, illustrative programs.

UNIT II

Vectors and Matrix Computations: Scalars and vectors, entering data in matrices, line continuation, matrix subscripts/indices, Transpose, dot product, matrix multiplication, matrix powers, matrix inverse, determinants, solutions to systems of linear equations : solution using matrix inverse, solution using matrix left division, special Matrices: identity matrix, diagonal matrices

UNIT III

Polynomials: Entering a polynomial, polynomial evaluation, and roots of polynomial, polynomial operations - addition and subtraction, multiplication, division, formulation of polynomial equation, characteristic polynomial of a matrix, polynomial differentiation, integration, and curve fitting, evaluation of polynomial with matrix arguments.

UNIT IV

MATLAB Graphics: Two-dimensional plots, multiple plots, style options, legend command, subplots, specialized two-dimensional plots, three-dimensional plots.

Symbolic Processing With MATLAB: Symbolic Expressions and Algebra, Algebraic and Transcendental Equations, Calculus, Symbolic Linear Algebra, ordinary and partial differential equation, Symbolic Tutors

TEXT BOOK:

1. Rudra Pratap; *Getting started with MATLAB*; Oxford university press.

REFERENCE BOOKS:

1. David F. Griffiths; *An introduction to MATLAB*; Oxford University Press.
2. Jaydeep Chakravorty; *Introduction to MATLAB programming*, toolbox and Simulink

BSPH 160 BASIC PHYSICS LAB – II (Credit-1)

List of Experiments

1. To determine the value of e/m of electron by J. J. Thomson method.
2. To determine unknown resistance of a wire by Carey Foster's Bridge.
3. To determine the internal resistance of Leclanche cell using potentiometer.
4. To study the charging and discharging of a capacitor and to find out the time constant.
5. To find the thermal conductivity of a poor conductor by Lee's disk method.
6. To study the themo EMF using thermocouple and resistance using Pt Resistance thermometer.
7. To determine the velocity of ultrasound waves using and ultrasonic spectrometer in a given liquid (Kerosene Oil).
8. To measure the frequency of a sine-wave voltage obtains from signal generator and to obtain Lissajous pattern on the CRO screen by feeding two sine wave voltages from two signal generator.
9. To determine the temperature Co-efficient of resistance of platinum by Calllender & Griffith'sBridge.
10. To study Hall Effect.
11. To determine Planck's constant.

REFERENCE BOOKS:

1. C. L.Arora, B. Sc Practical Physics, S Chand and Co. Ltd., New Delhi.
2. GeetaSanon, BSc Practical Physics, S. Chand & Co.
3. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New
   Delhi.
4. InduPrakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal, New Delhi.
5. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, VaniPublication House, New Delhi.
6. Nelson and Jon Ogborn, Practical Physics.

BSPH201 MATHEMATICAL PHYS- ICS-III (Credit-5)

Course Objective: Study of the topics included in this course will enable the students to:-

- develop the mathematical methods for application to problems in physics,
- gain the insight of matrices,
- learn the differential equations,

UNIT I

Importance of Complex Numbers and their Graphical Representation, De-Moivre's Theorem, Roots of Complex Numbers, Euler's Formula, Functions of Complex Variables, Examples, Cauchy-Riemann Conditions, Analytic Functions, Singularities, Differentiation and Integral Formula, Morera's Theorem, Cauchy's Inequality, Liouville's Theorem, Fundamental Theorem of Algebra, Multiple Valued Functions, Simple Ideas of Branch Points and Riemann Surfaces, Power Series of a Complex Variable, Taylor and Laurent Series.

UNIT II

Matrices: Addition and Multiplication of Matrices, Null Matrices, Diagonal, Scalar and Unit Matrices, Upper-Triangular and Lower-Triangular Matrices, Transpose of a Matrix, Symmetric and Skew-Symmetric Matrices, Conjugate of a Matrix, Hermitian and Skew-Hermitian Matrices, Singular and Non-Singular matrices, Adjoint of a Matrix, Inverse of a Matrix by Adjoint Method, Similarity Transformations, Orthogonal and Unitary Matrices, Trace of a Matrix, Inner Product, Eigen-values and Eigenvectors, Cayley-Hamiliton Theorem, Diagonalization of Matrices, Solutions of Coupled Linear Ordinary Differential Equations, Bilinear and Quadratic Forms, Functions of a Matrix.

UNIT III

Second Order Differential Equations and Special Functions: Series Solution of Linear Second Order Ordinary Differential Equations: Singular Points of Second Order Differential Equations and their Importance, Series Methods (Frobenius), Legendre, Bessel, Hermite and Laguerre Differential Equations.

UNIT IV

Legendre, Hermite and Laguerre Polynomials: Rodrigues' Formulae, Generating Functions, Recurrence Relations, Orthogonality, Series Expansion of a Function in terms of a Complete Set of Legendre Functions, Bessel Functions: First and Second Kind, Generating Function, Recurrence Formulas, Zeros of Bessel Functions and Orthogonality.

TEXT BOOKS

1. H. K. Dass and R. Verma, Higher Mathematical Physics (S. Chand).

REFERENCE BOOKS:

1. George E, Andrews, Richard Askey, Ranjan Roy Special Functions (Cambridge University Press),
2. Erwin Kreyszig, Advanced Engineering Mathematics (Wiley Eastern Limited),
3. W, W, Bell, Special Functions for Scientists and Engineers (Dover Publishers),
4. Mark J, Ablowitz, A, S, Fokas, Complex Variables: Introduction and Applications (Cambridge University Press),
5. Murray R, Spiegel, Schaum's Outline of Complex Variables (McGraw-Hill),
6. Charlie Harper, Introduction to Mathematical Physics (P.H.I.).

BSPH203 THERMAL PHYSICS (Credit-5)

Course objective: Study of the topics included in this course will enable the students to:-

- develop the insight of thermodynamical application in physics,
- gain the insight of behavior of gaseous state ,
- learn the calculations of thermodynamic variables,

UNIT I

Thermodynamics: Zeroth and First Law of Thermodynamics: Thermodynamical Equilibrium, Zeroth Law of Thermodynamics and Concept of Temperature, Work and Heat Energy, State Functions, First Law of Thermodynamics, Differential form of First Law, Internal Energy, First Law and Various Processes, Applications of First Law: General Relation between Cp and Cv, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Atmosphere and Adiabatic Lapse Rate,

Second Law of Thermodynamics: Reversible and Irreversible Changes, Conversion of Work into Heat and Heat into Work, Heat Engines, Carnot Cycle, Carnot Engine and its Efficiency, Refrigerator and its Efficiency, Second Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence, Carnot Theorem, Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale,

UNIT II

Entropy: Change in Entropy, Entropy of a State, Clausius Theorem, Clausius Inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas, Entropy of the Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of Increase of Entropy, Impossibility of Attainability of Absolute Zero: Third Law of Thermodynamics, Temperature-Entropy Diagrams, First and second order Phase Transitions,

Thermodynamic Potentials: Extensive and Intensive Thermodynamic Variables, Thermodynamic Potentials U, H, F and G: Their Definitions, Properties and Applications, Surface Films and Variation of Surface Tension with Temperature, Magnetic Work,

UNIT III

Maxwell's Thermodynamic Relations: Derivations of Maxwell's Relations, Applications of Maxwell's Relations: ClausiusClapeyron equation, Values of Cp-Cv, Tds Equations, Joule-Kelvin Coefficient for Ideal and Van der Waal Gases, Energy Equations and Change of Temperature during an Adiabatic Process,

Kinetic Theory of Gases: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas, Mean, RMS and Most Probable Speeds, Degrees of Freedom, Law of Equipartition of Energy Specific Heats of Gases, Mean Free Path, Collision Probability, Estimates of Mean Free Path, Transport Phenomenon in Ideal Gases: Viscosity, Thermal Conductivity and Diffusion, Brownian Motion and its Significance,

UNIT IV

Behavior of Real Gases

Deviations from the Ideal Gas Equation, The Virial Equation, Critical Constants, Continuity of Liquid and Gaseous State, Vapor and Gas, Boyle Temperature, Van der Waal's Equation of State for Real Gases, Values of Critical Constants, Law of Corresponding States, Comparison with Experimental Curves, p-V Diagrams, Joule's Experiment, Free Adiabatic Expansion of a Perfect Gas, Joule-Thomson Porous Plug Experiment, Joule-Thomson Effect for Real and Van der Waal Gases, Temperature of Inversion, Joule-Thomson Cooling,

TEXT BOOKS

1. J.P. Aarwal, Satya Prakash, Thermal Physics (Pragati Prakashan).

REFERENCE BOOKS:

1. Enrico Fermi Thermodynamics (Courier Dover Publications),
2. A Treatise on Heat: Including Kinetic Theory of Gases, Thermodynamics and Recent Advances in Statistical Thermodynamics By MeghnadSaha, B, N, Srivastava (Indian Press).
3. Heat and Thermodynamics: An Intermediate Textbook By Mark Waldo Zemansky, Richard Dittman (McGraw-Hill),
4. Thermal Physics by Garg, Bansal and Ghosh (Tata McGra-Hill).
5. Thermodynamics, Kinetic Theory, and Statistical Thermodynamics by Francis W, Sears & Gerhard L, Salinger, (Narosa).

BSPH205 Classical Mechanics (Credit-5)

Course objective: Study of the topics included in this course will enable the students to:-

- develop the insight of macro systems in physics,
- gain the insight of mechanical behavior systems.
- learn the calculations of energy, momentum etc in different physical systems,

UNIT I

Elementary Principles: Conservation Theorems (for a single particle and system of particles), Centre of mass, Motion of centre of mass, Collisions and its types, the systems of variable mass:the Rocket, Angular momentum, Applications of conservation of angular momentum (motion of satellite in orbit, scattering of positive charged particle by nucleus, the shape of the galaxy, angular momentum of the elementary particles), conservative forces, Energy:kinetic and potential, conservative forces as negative gradient of potential energy, potential energy curve, non-conservative forces.

UNIT II

Lagrangian Formulation: Constraints and their classification, degrees of freedom and generalized coordinates, transformation equations, configuration space, virtual displacement and principle of virtual work, d'Alembert's principle, Lagrange's equation of motion for conservative and non conservative systems, Lagrange's equation for systems containing dissipative forces, applications, Lagrangian formulation of conservation theorems: generalized momentum, cyclic co-ordinates (conservation of generalized momentum, energy, angular momentum, linear momentum)

UNIT III

Hamiltonian Formulation: Phase space, Hamiltonian function, Hamilton`s equations, physical significance of Hamiltonian, cyclic coordinates, applications of Hamilton`s equations, vibrational principle (Euler-Lagrange equation), Hamilton`s principle, modified Hamilton`s principle, derivation of Hamiltons equations from modified Hamilton`s principle, principle of least action,

Canonical transformation: Canonical transformation equations, Poisson brackets and its properties, invariance of Poisson bracket under canonical transformation, Lagrange bracket and its properties, relation between Poisson and Lagrange bracket.

UNIT IV

Moving Co-ordinate systems

Galilean transformation, Galilean transformation for the velocity of the particle, accelerated frames: translational acceleration, rotation with constant angular velocity, Coriolis and centripetal forces, components of Coriolis force at any latitude when velocity is horizontal, derivation of free falling bodies from the vertical, motion of particle relative to rotating earth. facoult`s pendulum

TEXT BOOKS

1. Classical Mechanics, S.L. Gupta, V. Kumar and H.V. Sharma (Pragati Prakashan).

REFERENCE BOOKS:

1. Classical Mechanics, H. Goldstein, C Pooley, J Safko (Addison Wesley).
2. J.C. Upadhyaya,Classical Mechanics (Himalaya Publication house).
3. Classical Mechanics: A Modern Perspective, Barger & Olsson (McGraw Hill International).
4. Introduction to Classical Mechanics, Takwale and Puranik (Tata McGraw-Hill).
5. Classical Mechanics, N. C. Rana and P. S. Joag (Tata McGraw-Hill India).
6. Classical Mechanics, Mondal (Prentice-Hall India).
7. Classical Mechanics, S.N. Biswas (Books and Allied Ltd).

BSPH209 Modern PHYSICS (Credit-5)

Course objective: Study of the topics included in this course will enable the students to:-

- understand the basic principles underlying classical physics,
- understand the connection between classical and quantum mechanics,
- gain in site of device application,

UNIT I

Optical Fibers: Propagation of light, fractional refractive index, numerical aperture, skin depth, modes of propagation, classification of optical fibers,V-number, fabrication, splicing , losses in optical fiber-attenuation and distortion; bandwidth, fiber optical communication system, fiber optical sensors, applications,

UNIT II

Architectural Acoustic: Sound classification of sound, characteristic of musical sound,Weber-Fechner law, sound intensity level, human Audiogram, phon and sone, sound reflection, reverberation time, sound absorption, Sabine`s formula for reverberation time, reverberation theory, absorption coefficient, factors affecting acoustics of building and their remedies, acoustic design of a hall,

UNIT III

Ultrasonics: Production, piezoelectric effect, detection and properties of ultrasonic waves, cavitations, types of ultrasonic waves, velocity determination (interferometer and acoustic diffraction method), elastic constant in liquid, velocity of ultrasonic waves in solids, ultrasonic testing with modes of display (A,B and C scan), ultrasound scanner with modes of display, applications-industrial and medical,

UNIT IV

Electron Ballistics: Electric field, Motion of electron in uniform electric field (parallel, perpendicular motion, electrostatic deflection and inclined motion), electron volt, uniform magnetic field, Motion of electron in uniform magnetic field (parallel, perpendicular motion and inclined motion magnetostatic deflection), Lorentz equation, crossed electric and magnetic field configuration, velocity, selector, parallel electric and magnetic field configuration, e/m of electron; mass, charge and radius of electron

Electron Optics: Bethe`s law, electron lens, focusing of electron beam by uniform and axially symmetric magnetic field, cathode ray tube(CRT), electromagnetic deflection type CRT, cathode ray oscilloscope (CRO) and its applications, motion of charged particle in a non-uniform magnetic field,

TEXT BOOKS

1. M.N.. Avadhanulu, P.G. Kshirsagar, Engineering Physics (S.Chand).

REFERENCE BOOKS:

1. Concepts of Modern Physics, Arthur Beiser.

BSPH207 Chemistry-II (Credit-4)

Course Objective: The objective of this course is to:

- introduce basics of inorganic chemistry
- thermo chemistry and thir application in engineering science,
- gain in site of phase and polymers

UNIT I

The periodic classification of elements and periodic properties: The relationship between chemical periodicity and electronic structure of the atom; The long form of the periodic table; Trends among representative elements; Atomic volume; Atomic and ionic radii; Periodic trends in atomic and ionic radii; Metallic/non-metallic character; standard electrode potential; Periodic trends in electrode potential; Ionization potential; Electron affinity and electronegativity; Electronegativity scale; Bond energies; Oxidation numbers and oxidation states; Periodicity in oxidation state of valence; Oxidizing or reducing behaviour; Acidic and basic character of oxides,

UNIT II

Fuels: Classification; Calorific value of fuel and its determination; Bomb calorimeter; Boy's Gas calorimeter; Solid fuels- Proximate and ultimate analysis, High & Low temperature carbonization, manufacture of coke (Otto-Hoffmann oven); Liquid Fuels - Petroleum-Chemical composition, fractional distillation, Thermal & catalytic cracking, Octane &Cetane No, and its significance; Power alcohol, Analysis of flue gases (Orsat's apparatus),

UNIT III

Gaseous state and thermo chemistry: Gas laws and kinetic theory of gases; Distribution of molecular velocities; Mean free path; Real gases-non ideal behavior; Causes of deviation from ideal behavior; Vander Waal's equation; liquefaction of gases,
Hess's Law; Heat of Reaction; Heat of dilution; Heat of Hydration; Heat of neutralization and Heat of Combustion; Effect of temperature on heat of reaction at constant pressure (Kirchhoff s equation); Flame Temperature

UNIT IV

The phase rule and polymers: Definition of various terms, Gibb's Phase rule, Application of phase rule to one component system- The water system and carbon dioxide system, Two component system:Lead-silver,Na_2SO_4-water,

Polymers and its classification: Mechanism of addition and condensation polymers; Coordination polymerization; Synthesis, properties and uses of urea formaldehyde, phenol formaldehyde, poly vinyl acetate and polythene; Conducting and bio-polymers,

TEXT BOOK

1. Sunita Ratan, A text book of Engineering Chemistry (S. Chand).

REFERENCE BOOKS:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed,), By J,C, Kuriacose& J, Rajaram
2. Principles of Physical Chemistry, (Latest ed,), Puri B. R., Sharma L.R., and Pathania M.S.

BSCS215 OBJECT ORIENTED LANGUAGE (Credit-3)

Course Objective: The objective of the course module is to acquaint students with object-oriented programming using C++.

UNIT I

Introduction: Introducing Object-Oriented Approach related to other paradigms, Characteristics of Object-Oriented Languages.

Basic terms and ideas: Abstraction, Encapsulation, Information hiding, Inheritance, Polymorphism, Difference between C and C++, Structure of C++ program, Variable Declaration, Dynamic Initialization of Variables, Reference Variables in C++, Scope resolution Operators, Expressions and their types, Control Structures, Functions in C++

UNIT II

Classes and Objects: Defining Class and associated member functions, Making a outside function inline, Types of member functions, Instantiation of objects, Memory Allocation for Objects, Friendly Functions, Constructors and Destructors, , Default parameter value, Copy Constructor, Static Class Data, const Objects, Operator Overloading

UNIT III

Inheritance: Inheritance, Types of Inheritance, Class hierarchy, derivation – public, private & protected, Virtual Base Class, Abstract Classes

UNIT IV

Polymorphism: Polymorphism, Type of Polymorphism – Compile time and runtime, Concept of pointers, this pointer, Method polymorphism, Pointer to Derived Classes, Virtual Functions, Pure Virtual Functions

TEXT BOOKS:

1. E. Balaguruswamy, “Object-Oriented Programming with C++”, Tata McGraw Hill

Reference Books:

1. R. Lafore, “Object Oriented Programming using C++”, BPB Publications
2. Schildt Herbert, “C++ Programming”, 2nd Edition, Wiley DreamTech.

BSPH251 BASIC PHYSICS Lab-III (Credit-1)

1. To determine J by Callender and Barne's constant flow method.
2. To determine the Coefficient of Thermal Conductivity of Copper by Searle's Apparatus.
3. To determine the Coefficient of Thermal Conductivity of Copper by Angstrom's Method.
4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.
5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
6. To calibrate a Resistance Temperature Device (RTD) to measure temperature in a specified range using Null Method/ Off-Balance Bridge with Galvanometer based Measurement.
7. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.
8. To Calibrate a Thermocouple to measure Temperature in a Specified Range using (1)Null Method (2) Direct Measurement using an Op-Amp Difference Amplifier and to determine Neutral Temperature.
9. To study one dimensional collision using two hanging spheres of different materials.
10. To measure the numerical aperture of an optical fibre using a He-Ne laser source.
11. To measure the attenuation or propagation loss in an optical fibre using He-Ne laser source.
12. To find the value of e/m for an electron by Thomson's method using bar magnets.
13. To determine the velocity of ultrasonic waves in a given liquid (say Kerosene oil).
14. Measurement of voltage and frequency of a given signal using CRO.
15. To study Hall Effect.
16. To determine Planck's constant.
17. To determine the Hystersis loss of ferromagnetic material using CRO.
18. Measurement of dielectric constant.
19. (a) To convert galvanometer into ammeter.

    (b) To convert galvanometer into voltmeter.
20. To study the series & parallel combinations of resistance.
21. Analog to Digital and Digital to Analog.

REFERENCE BOOKS:

1. GeetaSanon, BSc Practical Physics, 1st Edn. (2007), R. Chand & Co.
2. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, NewDelhi.
3. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal, NewDelhi.
4. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, VaniPublication House, New Delhi.
5. Nelson and Jon Ogborn, Practical Physics.

BSCH257 CHEMISTRY LAB-II (Credit-1)

1. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
2. Determine the amount of Oxalic acid and Sulphuric acid in one liter of solution, given standard sodium hydroxide and Potassium Permanganate.
3. Determine the amount of copper in the copper ore solution, provided hypo solution.
4. Argent metric titration one each by Vohlard's method and by Mohr's method.
5. Complex metric titrations.
6. Determine the heat of neutralization of strong acid with strong base.
7. Determine the surface tension of a liquid using drop weight method.
8. Determine viscosity of a given liquid (density to be determined).
9. Determine the reaction rate constant for the Ist order reaction.
10. Determine the cell constant of a conductivity cell.
11. Find out strength of given solution of HCl conduct metrically.
12. Preparation of urea formaldehyde and phenol formaldehyde resins.
13. Determination of dissolved oxygen in the given sample of water.
14. Determination of alkalinity in the given sample of water.

REFERENCE BOOKS:

1. O. P Pandey, D. N Bajpai and S. Giri, Practical chemistry, S. Chand & Company Pvt. Ltd.
2. F. G. Mann and P. C. Saunders, Practical organic chemistry, Green and Co. Ltd.
3. A.I. Vogel, Text-Book of Practical Organic Chemistry, Prentice Hall 5th Edition.
4. A.I. Vogel, Qualitative Inorganic Analysis, Prentice Hall 7th Edition.

BSCS259 OBJECT ORIENTED LANGUAGE LAB (Credit-1)

1. Write a program which accept principle, rate and time from user and print the simple interest. Solution.
2. Write a program which input principal, rate and time from user and calculate compound interest. You can use library function.

CI = P(1+R/100)T.

3. Write a program to display the following output using a single count statement.

Subject	Marks
Mathematics	90
Computer	77
Chemistry	69 solution

4. Write a program which accepts a character and display its ASCII value. Solution.

5. Write a program to swap the values of two variables. Solution.
6. Write a program to calculate area of circle. Solution
7. Write a program to check whether the given number is positive or negative (using ? : ternary operator) solution
8. Write a program which accepts days as integer and display total number of years, months and days in it.
9. Any year is input by the user. Write a program to determine whether the year is a leap year or not.
10. Write a program to find the roots of and quadratic equation of type ax2+bx+c where a is not equal to zero.
11. The marks obtained by a student in 5 different subjects are input by the user.
    The student gets a division as per the following rules:
    Percentage above or equal to 60 - First division
    Percentage between 50 and 59 - Second division
    Percentage between 40 and 49 - Third division
    Percentage less than 40 - Fail
12. Write a program to calculate the division obtained by the student.
13. Write a program which displays a number between 10 to 100 randomly.
14. Write a program using function which accept two integers as an argument and return its sum. Call this function from main ( ) and print the results in main( ).
15. Write a function that receives two numbers as an argument and display all prime numbers between these two numbers. Call this function from main ( ).
16. Write a C++ program to find the sum and average of one dimensional integer array.
17. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT.
18. Write a user-defined function in C++ to read the content from a text file OUT.TXT, count and display the number of alphabets present in it.
19. Declare a structure to represent a complex number (a number having a real part and imaginary part).

Write C++ functions to add, subtract, multiply and divide two complex numbers.

20. An array stores details of 25 students (roll no, name, and marks in three subjects).
    Write a program to create such an array and print out a list of students who have failed in more than one subject.
21. Write a program to find the length of string.
22. Write a program to reverse a string.
23. Write a program to check a string is palindrome or not.
24. Write a program which accept a letter and display it in uppercase letter.
25. Write a user-defined function in C++ to display the multiplication of row element of two-dimensional array A [4][6] containing integer.

BSPH202 MATHEMATICAL PHYS ICS-IV (Credit-5)

Course Objective: Study of the topics included in this course will enable the students to:-

- develop the mathematical methods for application in physics,
- gain the insight of different transforms,
- learn the partial differential equations,

UNIT I

Fourier Transforms: Fourier Integral Theorem, Sine and Cosine Transforms, Properties of FTs: FTs of Derivatives of Functions, Change of Scale Theorem, FTs of Complex Conjugates of Functions, Shifting Theorem, Modulation Theorem, Convolution Theorems, and Parseval's Identity,

Laplace Transforms: Existence Theorem, LTs of Elementary Functions, Properties of LTsChange of Scale Theorem, Shifting Theorem, LTs of Derivatives and Integrals of Functions, Derivatives and Integrals of LTs, LT of Unit Step function, LTs of Periodic Functions, and Convolution Theorem, Inverse LT (Bromwich Integral),

UNIT II

Applications of Laplace Transforms: (1) Solution of First and Second Order ODEs, (2) Solution of Simultaneous First Order ODEs, (3) Solution of One-Dimensional PDEs : Wave and Diffusion Equations, (4) Evaluation of Definite Integrals.

Dirac Delta Function

Definition, Representation and Properties of Dirac Delta Function.

UNIT III

Partial Differential Equations: General Solution of Wave Equation in 1 Dimension, Transverse Vibrations of Stretched Strings, Oscillations of Hanging Chain, Wave Equation in 2 and 3 Dimensions, Vibrations of Rectangular and Circular Membranes,

UNIT IV

Heat Flow in One, Two, and Three Dimensions, Heat Flow in Rectangular Systems of Finite Boundaries, Temperature inside Circular Plate, Laplace Equation in Cartesian, Cylindrical and Spherical Coordinate Systems, Problems of Steady Flow of Heat in Rectangular and Circular Plate,

TEXT BOOK

2. H. K. Dass and R. Verma, Higher Mathematical Physics (S. Chand).

REFERENCE BOOKS:

1. A. W. Joshi, Matrices and Tensors in Physics (New Age Int.Pub.).
2. Methods of Mathematical Physics: Partial Differential Equations by R. Courant & D.Hilbert (New Delhi: Wiley India).
3. Ward Cheney and David Kincaid, Linear Algebra Theory and Applications (Jones & Bartlett).
4. M. C. Jain, Vector Spaces and Matrices in Physics (Alpha Science International Ltd).
5. Partial Differential Equations for Scientists and Engineers By Stanley J. Farlow (Dover Publishers).
6. Erwin Kreyszig, Advanced Engineering Mathematics (Wiley Eastern Limited).
7. A Text Book of Differential Equations By N, M, Kapoor (Pitambar Publishing).

BSPH204 Nuclear PHYS ICS (Credit-5)

Course Objective: Study of the topics included in this course will enable the students to:-

- equip students with a firm foundation in the principles of science and engineering relevant to nuclear processes and their application and to
- prepare students for professional growth and further education in their chosen fields

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 curve, nuclear radius, angular momentum and parity, qualitative discussion of two-body nuclear forces, nuclear moments, magnetic dipole moment and electric quadrupole moment, semi empirical mass formula (Bethe and Wiezsacker formula) and its applications

UNIT II

Nuclear Reactions: Types of Reactions and Conservation Laws, Concept of Compound and Direct Reaction, Compound Nucleus, Scattering Problem in One Dimension: Reflection and Transmission by a Finite Potential Step, Stationary Solutions, Attractive and Repulsive Potential Barriers, Scattering Cross-section, Reaction Rate, Q-value of Reaction, Fission and Fusion,

UNIT III

Radioactive decays: Modes of decay of radioactive nuclides and decay Laws, chart of nuclides and domain of instabilities, Radioactive dating, constituents of Cosmic rays, α-decay: Stability of heavy nuclei against break up, Range of α-particles, Geiger-Nuttal law and α-particle Spectra, Gamow Theory of Alpha Decay, Beta decays : β^-, β^+ and electron capture decays, allowed and forbidden transitions (selection rules),parity violation in □-decay, Gamma transitions: Excited levels, isomeric levels, gamma transitions, multipolemoments, selection rules, transition probabilities, internal conversion (IC), determination of multipolrity from γγ-correlation and IC measurements,

UNIT IV

Nuclear Models: Liquid drop model, condition of stability, Fermi gas model, evidence for nuclear magic numbers, Shell model: Experimental evidence, main assumptions of single particle shell model, spin-orbit coupling of electron bound in atom, spin-orbit coupling in nuclei, single particle shell model with parabolic potential, single particle shell model with square well potential, predictions of shell model.

TEXT BOOK

1. S. N. Ghoshal, Nuclear Physics (S. Chand).

REFERENCE BOOKS:

1. Basic ideas and Concepts in Nuclear Physics: K. Hyde (Institute of Physics).
2. Introduction to Nuclear Physics: H.A. Enge (Addison-Wesley).
3. Nuclear Physics: I. Kaplan (Narosa).
4. Nuclei and Particles: E. Segre (W.A. Benjamin Inc).

BSPH206 ATOMIC AND MOLECULAR PHYSICS (Credit-5)

Course objective: The course content of this course will help students to :

- understand the structure and dynamics of both atoms and molecules.
- clarify the concept of atomic and molecular stability of materials.

UNIT I

Atom Models: Rutherford scattering experiment and the nuclear model of the atom, size of the nucleus, atomic spectra and spectral series.

Bohr model of the atom: energy levels and spectral series, line spectra, discovery of deuterium, correspondence principle, nuclear (reduced) mass and its effect of the atomic spectra: discovery of deuterium, positronium and muonic atom energy levels compared to hydrogen energy levels, critical potentials, atomic excitation, Franck-Hertz experiments.

Sommerfeld relativistic model and fine structure of hydrogen.

Quantum (Vector) model of the hydrogen atom (no derivation) and quantum numbers, principal quantum number, orbital quantum number, magnetic quantum number, probabilistic electronic orbits (radial and angular), radiative transitions, selection rules.

UNIT II

Effect of Magnetic Fields and Many Electron Atoms: Normal Zeeman effect, gyro-magnetic ratio, Bohr magneton, spin of the electron, spin angular momentum, magnetic dipole moments due to orbital motion and spin of the electron, exclusion principle, Stern-Gerlach experiment. Symmetric and anti-symmetric wave functions, bosons and fermions, atomic shells, subshells and periodic table Spin-orbit coupling, anomalous Zeeman effect, Paschen-Back effect, Stark effect, total angular momentum, *LS* coupling, *j-j* coupling, singlet, doublet, triplet, term symbols. Atomic spectra of hydrogen, sodium.Atomic spectra of helium and mercury.

UNIT III

X-Ray Spectra: X-rays: production, Laue's experiment, Bragg's law, X-ray spectra: continuous and characteristic spectra, Mosley's law and X-ray series, Auger effect, X-ray absorption
spectra, absorption edges.

Lasers

Einstein's A and B coefficients, Metastable states, Spontaneous and Stimulated emissions, Optical Pumping and Population Inversion, Three-Level and Four-Level Lasers, Ruby Laser and He-Ne Laser,

UNIT IV

Molecular Physics: Molecular bond, covalent bond, H2+ molecular ion, Hydrogen molecule, complex molecules, hybrid orbitals: ethylene, benzene, Rotational Energy levels, Selection Rules and Pure Rotational Spectra of a Molecule, Vibrational Energy Levels, Selection Rules and Vibration Spectra, Rotation-Vibration Energy Levels, Selection Rules and Rotation-Vibration Spectra, Determination of Internuclear Distance, electronic spectra: fluorescence, phosphorescence.

Raman Effect: Quantum Theory of Raman Effect, Characteristics of Raman Lines, Stoke's and Anti-Stoke's Lines, Complimentary Character of Raman and infrared Spectra,

TEXT BOOK

1. Raj Kumar, Atomic and Molecular Physics (Campus Book International).

REFERENCE BOOKS:

1. Concepts of Modern Physics by Arthur Beiser (McGraw-Hill Book Company, 1987)
2. Atomic physics by J,B,Rajam& foreword by Louis De Broglie,(S,Chand& Co,, 2007).
3. Atomic Physics by J,H,Fewkes& John Yarwood, Vol, II (Oxford Univ, Press, 1991).
4. Physics of Atoms and Molecules, Bransden and Joachein.
5. Molecular Spectroscopy, Banwell.
6. Optoelectronics by Ghatak and Thyagarajan,Principles of Lasers by Svelto

BSPH208 QUANTUM MECHANICS (Credit-5)

Course objective: The contents of this course will help students to:

- learn about formulations of basic laws at atomic level.
- understand the basic properties of matter at atomic level.

UNIT I

Particles and Waves: inadequacies in classical physics, blackbody radiation, quantum theory of light, photoelectric effect, compton effect, franck-hertz experiment, pair production, gravitational red shift, wave nature of matter: de broglie hypothesis, wave-particle duality, davisson-germer experiment, wave description of particles by wave packets, group and phase velocities and relation between them, two- slit experiment with electrons, probability, wave amplitude and wave functions, Heisenberg's uncertainty and its applications, Gamma ray microscope, electron diffraction

UNIT II

Operator Formalism: Linear Vector Space, orthogonal functions, Operators, linear operators, product of two operators, commuting and non-commuting, operators, commutator algebra, Eigen values and eigen functions, dynamic variable as operator, momentum operator, Hermitian operators, properties and theorems, superposition of eigen states, simultaneous eigen functions and commuting operators, reflection, projection and parity operators, analogy between poissin bracket and commutators, commutator algebra.

UNIT III

Basic Postulates of quantum mechanics, wave function, Schrödinger Wave Equation(time independent and time dependent), normalized and orthogonal wave functions, solution of Schrödinger Wave Equation, expectation values, probability current density

UNIT IV

Free article in a box, potential step, rectangular potential barrier, particle in infinitely deep well (1D and 3D case), square well potential, 1D well of finite depth (bound states), 1D linear harmonic oscillator.

TEXT BOOK

1. Quantum Mechanics, Satya Prakesh (Pragati Prakashan).

REFERENCE BOOKS:

1. L, I, Schiff, Quantum Mechanics (McGraw Hill Book Co,, New York),
2. E, Merzbacher, Quantum Mechanics (John Wiley & Sons, Inc),
3. J,L, Powell & B, Crasemann, Quantum Mechanics (Addison-Wesley Pubs,Co,)
4. A, Ghatak& S, Lokanathan, Quantum Mechanics: Theory and Applications (Macmillan India),
5. E, M, Lifshitz and L, D, Landau, Quantum Mechanics: Non-Relativistic Theory (Course of Theoretical Physics, Vol 3), 3rd Edition, Butterworth-Heinemann (1981),

BSPH210 STATISTICAL MECHANICS (Credit-5)

Course objective: The subject matter of this course will help students to

- Understand the basic concept of thermodynanics.
- Learn the principles of quantum mechanics.

UNIT I

Statistical Basis of Thermodynamics: Energy states and energy levels, degeneracy, macroscopic and microscopic states, thermodynamic probability and mathematical probability, connection between statistics and thermodynamics, physical significance of Q, Boltzmann's theorem and entropy, classical ideal gas

Statistical Description of Systems of Particles: Statistical description of states, statistical ensemble, number of states accessible to a macroscopic system, constraints, equilibrium and irreversibility, quantum state and phase space.

UNIT II

Ensembles: Microcanonical ensemble, canonical ensemble, grand canonical ensemble, partition function, statistical analogue of entropy, electronic partition function.Negative Temperature.Thermodynamic Functions of an Ideal Gas. Classical Entropy Expression, Gibbs Paradox. Law of Equipartition of Energy – Applications to Specific Heat and its Limitations.

Classical Theory of Radiation: Properties of Thermal Radiation.Blackbody Radiation.Pure Temperature Dependence.Kirchhoff's Law.Stefan-Boltzmann Law and Wien's Displacement law.Saha's Ionization Formula.

UNIT III

Quantum Theory of Radiation: Stefan-Boltzmann Law: Thermodynamic Proof. Radiation Pressure.Spectral Distribution of Black Body Radiation.Wien's Distribution Law and Displacement Law.Rayleigh-Jean's Law.Ultraviolet Catastrophe. Planck's Quantum Postulates. Planck's Law of Blackbody Radiation : Experimental Verification. Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan-Boltzmann Law and (4) Wien's Displacement Law from Planck's Law.

UNIT III

Bose-Einstein Statistics: B-E distribution law. Thermodynamic functions of a Completely Degenerate Bose Gas. Bose-Einstein condensation, properties of liquid He (qualitative description).Radiation as photon gas.Bose's derivation of Planck's law.

UNIT IV

Fermi-Dirac Statistics: Fermi-Dirac Distribution Law. Thermodynamic functions of an ideal Completely Degenerate Fermi Gas. Fermi Energy.Electron gas in a Metal.Specific Heat of Metals. White Dwarf Stars. Chandrasekhar Mass Limit.

TEXT BOOK

1. S.C.Garg, R.M.Bansal, C.K.Ghosh, Thermal Physics:Kinetic Theory, Thermodynamics and Statistical Mechanics (Mc Graw Hill).

REFERENCE BOOKS:

1. F Reif, Statistical Physics: Berkeley Physics Course Volume 5 (Tata McGraw-Hill Company Ltd).
2. S.Lokanathan and R.S.Gambhir, Statistical and Thermal Physics: An Introduction (P.H.I.).
3. R. K. Patharia, Statistical Mechanics (Oxford: Butterworth).
4. K. Huang, Statistical Mechanics (Wiley).

BSMA142 MATHEMATICS-II (Credit-4)

Course objective: The subject matter incorporated in this course will enable students to

- acquire knowledge regarding differential equations.
- understanding in the field of vector algebra.

UNIT I

Exact differential equation, equations reducible to exact differential equations, application of diiferential equation to Newton's law of cooling and orthogonal trajectories. Linear differential equations of second and higher order. Complete solution , complementary function and particular integral, method of variation of parameter to find particular intergral, Cauchy's and Legendre's linear equation , simultaneous linear equations with constant coefficients.

UNIT II

Complex number, geometrical representation of imaginary numbers,argand diagram,Equal complex number, addition of complex numbers, Subtraction, Power of iota,Multiplication, Iota as an operator, Conjugate of complex number, Division, Modulus and argument,Polar form, Type of complex number, Square root of complex number, Exponential and circular functions of complex variables, De-moivre's theorem, Roots of complex number, circular function of complex numbers, Sepration of real and imaginary parts of circular functions.

UNIT III

Double integration, Evaluation of double integral, evaluation of double integrals in polar co-ordinates, Change of order of integration, area by double integration, Volume by double integration, Tripple integration,Beta and gamma functions and their relation.

UNIT IV

Determinants. Matrix algebra, Simultaneous equations: method of substitution and elimination, consistency and independence. Homogeneous linear equations. Simultaneous equations with more than two unknowns (e.g. spectrophotometry), Cramer's rule, matrix inversion, orthogonal and unitary matrices, matrix eigenvalues and eigenvectors, diagonalization of a matrix.

TEXT BOOK

1. H. K. Dass and R. Verma, Higher Mathematical Physics (S. Chand).

REFERENCE BOOKS:

1. D.A. McQuarrie, Mathematics for Physical Chemistry (University Science Books).
2. R. Mortimer, Mathematics for Physical Chemistry, 3rd Ed. (Elsevier).
3. E. Steiner, The Chemical Maths Book (Oxford University Press).

BSPH252 BASIC PHYSICS LAB-IV (Credit-1)

Determination of Fundamental Constants

1. To determine the value of Boltzmann Constant by studying Forward Characteristicsof a Diode.
2. To determine the value of Planck's Constant by using a Photoelectric Cell.
3. To determine the value of Planck's Constant by using LEDs of at least 4 DifferentWavelengths.

Atomic & Molecular Physics

1. To determine the value of e/m by (a) Magnetic Focussing or (b) Bar Magnet.To determine the wavelengths of Hydrogen spectrum and hence to determine thevalue of Rydberg's Constant.
2. To determine the Wavelength of H-alpha Emission Line of Hydrogen Atom.
3. To determine the Absorption Lines in the Rotational Spectrum of Iodine Vapour.

Miscellaneous

1. To determine the Wavelength and the Angular Spread of a He-Ne Laser.
2. To determine the value of Stefan's Constant.
3. To determine the Wavelength and the Velocity of Ultrasonic Waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the Diffraction of light through an UltrasonicGrating.

REFERENCE BOOKS:

1. GeetaSanon, BSc Practical Physics, 1st Edn. (2007), R. Chand & Co.

2. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, NewDelhi.

3. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal, NewDelhi.

4. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, VaniPublication House, New Delhi.

5. Nelson and Jon Ogborn, Practical Physics.

BSDM301A DISASTER MANAGEMENT (Credits 3)

COURSE OBJECTIVE: The objective of the course is to create awareness about various types of disasters and to educate the learners about basic disaster management strategies. The course examines disaster profile of our country and illustrates the role played by various governmental and non- governmental organizations in its effective management. It also acquaints learners with the existing legal frame work for disaster management.

LEARNING OUTCOME: The course will -

1. Provide students an exposure to disasters, their significance and types.
2. Ensure that the students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
3. Provide the students a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
4. Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

Introduction to Disasters: Concept and definitions- Disaster, Hazard, vulnerability, resilience, risks.

Different Types of Disaster: Causes, effects and practical examples for all disasters.

- Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc
- Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc.

Disaster Preparedness and Response Preparedness

- Disaster Preparedness: Concept and Nature
- Disaster Preparedness Plan
- Prediction, Early Warnings and Safety Measures of Disaster.
- Role of Information, Education, Communication, and Training, Role of Government, International and NGO Bodies.
- Role of IT in Disaster Preparedness
- Role of Engineers on Disaster Management.
- Relief and Recovery
- Medical Health Response to Different Disasters

Rehabilitation, Reconstruction and Recovery

- Reconstruction and Rehabilitation as a Means of Development.
- Damage Assessment
- Post Disaster effects and Remedial Measures.
- Creation of Long-term Job Opportunities and Livelihood Options,
- Disaster Resistant House Construction
- Sanitation and Hygiene
- Education and Awareness,
- Dealing with Victims' Psychology,
- Long-term Counter Disaster Planning
- Role of Educational Institute.

Disaster Management in India

- **Disaster Management Act, 2005:**

Disaster management framework in India before and after Disaster Management Act, 2005, National Level Nodal Agencies, National Disaster Management Authority

- **Liability for Mass Disaster**
- Statutory liability
  - Contractual liability
  - Tortious liability
  - Criminal liability
  - Measure of damages

- **Epidemics Diseases Act, 1897: Main provisions, loopholes.**

- **Project Work**: The project/ field work is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety.

Projects must be conceived based on the geographic location and hazard profile of the region where the institute is located.

Reference Books:

- Government of India, Department of Environment, Management of Hazardous Substances Control
- Act and Structure and Functions of Authority Created Thereunder.
- Indian Chemical Manufacturers' Association & Loss Prevention Society of India, Proceedings of the National Seminar on Safety in Road Transportation of Hazardous Materials: (1986).
- Author Title Publication Dr. Mrinalini Pandey Disaster Management Wiley India Pvt. Ltd.
- Tushar Bhattacharya Disaster Science and Management McGraw Hill Education (India) Pvt. Ltd.
- Jagbir Singh Disaster Management: Future Challenges and Opportunities K W Publishers Pvt. Ltd.
- J. P. Singhal Disaster Management Laxmi Publications.
- Shailesh Shukla, Shamna Hussain Biodiversity, Environment and Disaster Management Unique Publications
- C. K. Rajan, Navale Pandharinath Earth and Atmospheric Disaster Management: Nature and Manmade B S Publication
- Indian law Institute (Upendra Baxi and Thomas Paul (ed.), Mass Disasters and Multinational Liability: The Bhopal Case (1986)
- Indian Law Institute, Upendra Baxi (ed.), Environment Protection Act: An Agenda for Implementation (1987)
- Asian Regional Exchange for Prof. Baxi., Nothing to Lose But our Lives: Empowerment to Oppose
- Industrial Hazards in a Transnational world (1989)
- Gurudip Singh, Environmental Law: International and National Perspectives (1995), Lawman (India) Pvt. Ltd.
- Leela Krishnan, P, The Environmental Law in India, Chapters VIII, IX and X (1999), Butterworths, New Delhi.

BSPH301 BASICS OF ELECTRONICS (Credit – 5)

Course Objective: Study of the topics included in this course will enable the students to:-

- develop the basic knowledge of semiconductors & transistors.
- understand the insight of amplifiers.
- learn about oscillators.

UNIT I

Semiconductor Diodes: p and n Type Semiconductors. Energy Level Diagram.Conductivity and Mobility.pn Junction Fabrication (Simple Idea). Barrier Formation in pn Junction Diode. Current Flow Mechanism in Forward and Reverse Biased Diode, Derivation of Mathematical Equations for Barrier Potential, Barrier Width and Current for Step Junction. pn junction and its characteristics. Static and Dynamic Resistance.Diode Equivalent Circuit.Ideal Diode.Load Line Analysis of Diodes.Load Line and Q-point.

Special purpose diode- zener diode, varactor diode, tunnel diode, photo diode, light emitting diode, gunn diode

UNIT II

Two-terminal Devices and their Applications: Half-wave, full-wave and bridge rectifier Calculation of Ripple Factor and Rectification Efficiency. Qualitative idea of C, L and π - Filters. Voltage Regulation. Regulated power supply

Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α, β and γ and Relations between them. Load Line Analysis of Transistors.DC Load line and Q-point.Physical Mechanism of Current Flow.Active, Cutoff, and Saturation Regions.Transistor in Active Region and Equivalent Circuit.

UNIT III

Amplifiers: Common emitter amplifier with an emitter resistance, RC-coupled amplifier, CC and CB amplifiers, Comparison of transistor amplifier configurations, Compound configurations – Cascade and Darlington connections.Distortion in amplifiers, Feedback in amplifiers, emitter follower as -ve feedback circuit.Power amplifiers- A, B, C, D, AB; Push-pull emitter follower.RC-Coupled Amplifier and its Frequency Response of Voltage Gain.

UNIT IV

Oscillators: Voltage gain of a feedback amplifier - Barkhausen criterion - Hartley, Colpitt's, phase shift and Weinbridge oscillators - expressions for frequency of oscillations and condition for sustained oscillations in each case - crystal oscillator - frequency stability.

Wave Shaping Circuits And Multi Vibrators: Clipping and clamping circuits - biased clipper - integrating and differentiating circuits Multivibrators - Astable - Mono stable and bi-stable multivibrators - Schmitt trigger

TEXT BOOK

1. V. K. Mehta, Principles of Electronics, S. Chand.

REFEENCE BOOKS:

1. Robert Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 8Th Edition, Pearson Education, India.
2. A. P. Malvino, Electronic Principals, Glencoe.
3. John Morris, Analog Electronics.
4. Allen Mottershead, Electronic Circuits and Devices, PHI.
5. Solid state electronic devices By Ben G. Streetman & Sanjay Banerjee, Pearson Prentice Hall.
6. Basic Electronics & Linear Circuits By N. N. Bhargava, D. C. Kulshreshtha & SC Gupta, Tata McGrawHill.

BSPH313 BASICS OF NANO SCIENC ES-I (Credit – 4)

Course Objective: The course incorporated in this paper will help students to

- understand the concepts of Nanotechnology
- gain in sight about the nano world, nono structure, etc.
- understand the concepts of characterization of nano materials.

UNIT I

Introduction to Nano world: Introduction of nanotechnology, Classification of nanostructures, Nanoscale architecture, Summary of the electronic properties of atoms and solids, The isolated atom, Bonding between atoms, Giant molecular solids, The free electron model and energy bands, Crystalline solids, Periodicity of crystal lattices, Electronic conduction, Effects of the nanometer length scale: Changes to the system total energy and structure, nanoscale dimensions affect properties; Fabrication methods: Top-down processes, Bottom-up processes, Methods for templating the growth of nanomaterial's, Ordering of nanosystems; Preparation, safety and storage issues; Challenges in Nanotechnology.

UNIT II

Magnetism in Nonmaterials

Introduction, Magnetism in Matter: Magnetic Moment, Magnetic Order, Magnetocrystalline Anisotropy, Magnetization Process and Magnetic Materials: Energy of the Demagnetising Field. Domains and Walls, the Magnetisation Process, Magnetic Materials.

Magnetism in Small Systems

Magnetic Moments in Clusters, Magnetic Order in Nanoparticles, Magnetic Anisotropy in Clusters and Nanoparticles. Magnetostatics and Magnetisation Processes in Nanoparticles: Single-Domain Magnetic Particles, Thermal Activation and Superparamagnetism, Coherent Rotation in Nanoparticles, From Thermal Activation to the Macroscopic Tunnel Effect; Magnetism in Coupled Nanosystems : Exchange-Coupled Nanocrystals, Ultrasoft Materials and Enhanced Remanence, Coercivity in Nanocomposites, Exchange Bias in Systems of Ferromagnetic Nanoparticles Coupled with an Antiferromagnetic Matrix.

UNIT III

Surface Microscopy: Atomic-Force Microscopy, Scanning-Tunneling Microscope, Lateral-Force Microscope and Surface Force Apparatus

Transport Measurements

Electrical Resistivity and Hall Effect, Thermopower, Peltier Coefficient, and Thermal Conductivity

UNIT IV

Magnetic Measurements: Vibrating-Sample Magnetometer (Foner Magnetometer), SQUID Magnetometer, Faraday Balance, AC Bridge

Resonance Techniques: Nuclear Magnetic Resonance, Nuclear Quadrupole Resonance, Electron-Spin Resonance, Mossbauer spectroscopy.

TEXT BOOK

1. Nanoscale Science and Technology, R. W. Kelsall, I. W. Hamley and M. Geoghegan (John Wiley & Sons. Ltd.).

REFERENCE BOOKS:

1. B.S. Murty, P.Shankar, Baldev Raj, B.B. Rath, James Murday, textbook of Nanoscience& Nanotechnology (Orient Blackswan Pvt. Ltd.)
2. Nanomaterials and Nanochemistry, C. Brechignac, P. Houdy, M. Lahmani, Springer
3. Chris Binns, Introduction to Nanoscience& Nanotechnology (Wiley).
4. B.K. Parthasarathy, Nanoscience& Nanotechnology (Isha Books).
5. Introduction to Magnetic Materials, B. D. Cullity, C. D. Graha (Wiley)
6. Solid State Chemistry and Its Applications, A. R. West, (Wiley).

BSPH305 Solid State Physics (Credit – 5)

Course objective: The subject matter incorporated in this course provides knowledge about

- The structural properties of materials.
- The electrical and magnetic properties of the materials.
- The possible use of different materials in field of science and technology.

UNITI

Crystal Structure: amorphous and crystalline materials, lattice translation vectors, lattice with a basis –unit cell, types of lattices symmetry elements, inter planer spacing, packing fraction, Miller Indices, reciprocal lattice, brillouin zones. Bonding in solids- ionic bond. covalent bond, metallic bonds, hydrogen bonding, van Der Waals bond, crystal defects , point defects, line defects, Burgers vector, dislocation (motion, energy, direction), surface imperfections.

UNIT II

Magnetic Properties of Matter: Classification of Magnetic materials-Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism.Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains.Discussion of B-H Curve. Hysteresis and Energy Loss, antiferromagnetism, ferrimagnetism

UNIT III

Dielectric Properties of Materials: Types of Polarization, Local Electric Field at an Atom, static Dielectric Constant, Electric Susceptibility, Polarizability, Classical Theory of Electric Polarizability, three vectors, Clausius-Mosotti Equation. Variation of dielectric polarization with temperature and frequency, pizo-pyro and ferroelectricity properties, domain theory of ferroelectricity, Complex Dielectric Constant, dielectrics in alternating fields, relaxation in dielectrics, absorption and losses, dielectric breakdowns.

UNIT IV

Semi-conductors: Band theory, types of semiconductors, carrier concentration in intrinsic and semiconductors, law of mass action, Fermi level in intrinsic and semiconductors, effect of temperature in carrier concentration and Fermi level, conductivity in semiconductors, drift and diffusion current in semiconductors, Hall effect and its applications.

TEXT BOOK

1. S O Pillai, Solid State Physics (New Age International Limited).

REFERENCE BOOKS:

1. Charles Kittel, Introduction to Solid State Physics (John Wiley and Sons, Inc.).
2. N. W. Ascroft and N. D. Mermin, Solid State Physics (Harcourt Asia, Singapore).
3. M. Ali Omar, Elementary solid state physics: principles and applications (Pearson Education).

BSPH311 LOW TEMPERATURE PHYS- ICS AND VACUUM TECH NOLOGY (Credit-5)

Course objective: The subject matter incorporated in this course provides knowledge about

- The basics of vacuum techniques & production and measurement of pressures.
- The production and measurement of low temperatures.
- The superconductivity.

UNIT I

Basics of Vacuum Techniques: Introduction, classification of vacuum ranges, throughput, Pump speed, speed of exhaust, conductance, ultimate pressure, viscous flow, molecular flow.

UNIT II

Production of Low Pressures: Pump types, Gaede oil-sealed rotating vane pump, Diffusion pump, sputterion pumps, Gettering, types of getters, Cryogenic pumps.

Measurement of Low Pressures: Types of gauges, Mcleod gauge, Pirani gauge, Measurement of ultrahigh vacuum.

Methodology of Vacuum systems: Materials for vacuum system, cleaning and sealing of vacuum system, Leak detection and its location.

UNIT III

Production and Measurement of Low Temperatures: Adiabatic throttling of gases, liquefaction of H_2 and He, Solidification of He. Liquid He II, Thermodynamics of □-transition, Adiabatic demagnetization, Temperatures below 0.01K, Low temperature thermometry.

Some Systems at Low Temperatures: Low temperature technique, Use of liquid air and other liquefied gases, Superfluidity in He II, Bose-Einstein Condensation in atomic clouds. LASER cooling and trapping of atoms, Superconductivity.

UNIT IV

Superconductivity: Introduction, Meissner effect , Type I and II superconductors , thermal properties, isotope effect, penetration depth, London`s equations, superconductors in AC fields, thermodynamics of superconductors, BCS theory, quantum and Josephson`s tunneling, AC and DC Josephson effect, applications of superconductors .

TEXT BOOK

1. A Text Book of Engineering Physics, M.N.Avadhanulu, P.G. Kshirsagar (S.Chand)

RECOMMENDED BOOKS:

1. Vacuum Technology: A. Roth (North Holland).
2. Low-Temperature Physics, Hans-Christian Stahl, Siegfried Hunklinger (Springer).
3. Handbook of High Vacuum Techniques: H.A. Steinherz (Reinhold Pub.).
4. A Treatise on Heat: M.N. Saha and B.N. Srivastava (Indian Press).
5. Low Temperature Physics: C. Dewitt, B. Dreyfus and P.G. de Gennes (Gordon & Breach).
6. Bose-Einstein Condensation in Dilute Gases: C.J. Pethick and H. Smith (Cambridge Univ.

Press) 2nd Ed.

BSPH3059 Particle Physics (Credit – 5)

Course objective: The subject matter incorporated in this course provides knowledge about

- The interaction of radiation and charged particles with matter.
- The nuclear detectors & accelerators.
- The elementary particles & particle properties and its reactions.

UNIT I

Interaction of radiation and charged particles with matter : Energy loss of electrons and positrons, Positron annihilation in condensed media, Stopping power and range of heavier charged particles, derivation of Bethe-Bloch formula, interaction of gamma rays with matter.

UNIT II

Nuclear radiation detection : Gas-filled detectors, proportional and Geiger-Muller counters, Scintillation detectors, solid-state detectors, Cherenkov effect, calorimeter-electromagnetic and hadron, specialized detectors, solid state nuclear track detectors, bubble chambers, nuclear emulsions.

Accelerators : Accelerators, linear accelerators, Van de Graff accelerators, cyclotron, synchro- cyclotron, electron synchrotron, proton synchrotron (bevatron), betatron, ion sources, focussing, stability, electron synchrotron, colliding beam machines, particle beams for fixed target experiments, CERN Super Proton Synchrotron (SPS) and FermilabTevatron.

UNIT III

Elementary Particles: Historical introduction, fermions and bosons, particles and antiparticles, Classification of particles, types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, Quantum numbers and conservation laws, isospin, charge conjugation, Yukawa theory, Introduction to quarks and qualitative discussion of the quark model, high energy physics units.

UNIT IV

Particle Properties and its reactions: Properties and life time of muon, pions: Determination of mass, spin and parity.Lifetime of neutral pion and isotopic spin. Strange particles: V particles, charged K-mesons, mass and life time for charged K-mesons. Observations of different strange particles, strange particle production and decay. Strangeness and Hypercharge.

TEXT BOOK

1. S.N. Ghoshal, Nuclear Physics (S.Chand Pub.).

RECOMMENDED BOOKS:

1. Basic ideas and Concepts in Nuclear Physics : K. Hyde (Institute of Physics).
2. Introduction to Nuclear Physics : H.A. Enge (Addison-Wesley).
3. Nuclear Physics : I. Kaplan (Narosa).
4. Nuclei and Particles, E. Segre (W.A. Benjamin Inc).
5. Introduction to High Energy Physics, D.H. Perkins, (Cambridge University),4th ed.
6. Elementary Particles by I.S. Hughes, (Cambridge University) 3rd ed.

BSPH351 Basic Physics Lab-V (Credit – 1)

Polarization

1. To verify the Law of Malus for Plane Polarized Light.
2. To determine the Specific Rotation of cane sugar using Polarimeter.
3. To analyze Elliptically Polarized Light by using a Babinet's Compensator.
4. To measure the Numerical Aperture of an Optical Fibre.

Measurement of Magnetic Field and Related Parameters

1. Measurement of field strength B and its variation in a Solenoid (Determination ofdB/dx).
2. To draw the BH curve of iron by using a Solenoid and to determine the energy lossdue to Hysteresis.

Measurement in Solid State Physics

1. To measure the Resistivity of a Ge Crystal with Temperature by Four-Probe Method(from room temperature to 200 oC) and to determine the Band Gap Eg for it.
2. To determine the Hall Coefficient and the Hall angle of a Semiconductor.
3. To study the PE Hysteresis loop of a Ferroelectric Crystal.
4. To measure the Magnetic susceptibility of Solids and Liquids.

REFERENCE BOOKS:

1. Geeta Sanon, BSc Practical Physics, 1st Edn. (2007), R. Chand & Co.

2. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, NewDelhi.

3. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal, NewDelhi.

4. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, VaniPublication House, New Delhi.

5. Nelson and Jon Ogborn, Practical Physics.

BSPH302 DIGITAL ELECTRONICS (Credit – 5)

Course Objective: The course incorporated in this paper will help students to

- understand the fundamentals of digital electronics.
- understand the Boolean algebra &airthemetic circuits.
- understand the data processing circuits, sequential logic & timers and counters.

UNIT I

Digital Fundamentals: Number systems - decimal, binary, octal and hexadecimal systems - conversion from one number system to another. Codes - BCD code - Excess 3 code, Gray code - ASCII code - Binary arithmetic - Binary addition - subtraction - unsigned binary numbers - sign magnitude numbers - 1's and 2's complement - Binary multiplication and division.

Logic gates and logic families: AND, OR circuits using diodes and transistors - NOT using transistors - NAND, NOR and EXOR - functions and truth tables. NAND & NOR as universal gates - bipolar and unipolar logic families - RTL NOR - DTL NAND - TTL NAND characteristics of TTL gates - ECL OR / NOR - MOS inverters - CMOS NAND and NOR.

UNIT II

Boolean Algebra and Simplification Of Logic Circuits:

Laws and theorems of Boolean algebra - De Morgan's theorems and their circuit implications - Duality theorem, simplification of Boolean equations - Karnaugh map - pairs, quads, octets - 2,3 and 4 variables - sum of products method - NAND - NAND circuits - product of sums methods - NOR-NOR circuits.

Arithmetic circuits: Arithmetic building blocks - Half adder - Full adder - parallel binary adder - Half subtractor - Full subtractor - The adder-subtractor - digital comparator - parity checker / generator

UNIT III

Data Processing Circuits: Multiplexers - Demultiplexers - Decoders - 1 of 16 decoder BCD to decimal decoder - seven segment decoder - Encoders - decimal to BCD encoder - Memory addressing - ROM, PROM, EPROM, PLA - RAM - Dynamic RAM - basic memory cells.

Sequential Logic

Flip - flops - RS Flip Flop - Clocked RS Flip-flop - D flip-flop - JK flip-flop - JK master slave flip-flop - T type flip-flop

UNIT IV

Clocks And Timers: Clock waveforms - TTL clock - 555 timer - astable, monostable - monostable with input logic.

Shift registers and counters: Types of registers - serial in serial out - serial in parallel out - parallel in serial out - parallel in parallel out - ring counter - asynchronous counter - decoding gates - omitted states - modulus counters - BCD counter - up down counter - synchronous counter - combination counters - decade counter - cascaded counters.

TEXT BOOK

1. Malvino and Leech, Digital Principles and Application, 4th edition, Tata McGraw Hill, New Delhi

REFERENCE BOOKS:

1. Millman and Halkias, Integrated Electronics, International edition, McGraw Hill, New Delhi
2. Thomas L. Floyd, Digital Fundamentals (Universal Book Stall, India).

BSPH326 BASICS OF NANO SCIENCES-II (Credit – 4)

Course Objective: The course incorporated in this paper will help students to

- understand the concepts of Nanotechnology
- gain in sight about the nano world, nono structure, etc.
- understand the concepts of characterization of nano materials.

UNIT I

Diffraction Techniques: Introduction X-ray Diffraction, Low-Energy Electron Diffraction, Reflection High-Energy Electron Diffraction, Neutron Scattering

Electron Microscopy: Scanning-Electron Microscopy, Transmission-Electron Microscopy, High-Resolution Transmission-Electron Microscopy, Low-Energy Electron Microscopy, Electron Spectroscopy and Ion Scattering.

UNIT II

Physical Chemistry of Solid Surfaces

Introduction

Surface Energy

Chemical Potential as a Function of Surface Curvature

Electrostatic Stabilization: Surface charge density, Electric potential at the proximity of solid surface, Van der Waals attraction potential, Interactions between two particles: DLVO theory; Solvent and polymer, Interactions between polymer layers, mixed steric and electric interactions

UNIT III

Zero-Dimensional Nanostructures: Nanoparticles: Introduction, Nanoparticles through Homogeneous Nucleation: Fundamentals of homogeneous nucleation, Subsequent growth of nuclei (Growth controlled by diffusion, Growth controlled by surface process); Synthesis of metallic nanoparticles: Influences of reduction reagents, Influences by other factors, Influences of polymer stabilizer, Synthesis of semiconductor nanoparticles; Synthesis of oxide nanoparticles:. Introduction to sol-gel processing, Forced hydrolysis, Controlled release of ions, Vapor phase reactions, Solid state phase segregation, Nanoparticles through Heterogeneous Nucleation: Fundamentals of heterogeneous nucleation, Synthesis of nanoparticles; Kinetically Confined Synthesis of Nanoparticles: Synthesis inside micelles or using micro emulsions, Aerosol synthesis,. Growth termination, Spray pyrolysis, Template-based synthesis; Epitaxial Core-Shell Nanoparticles

UNIT IV

Optical Spectroscopy: Optical Spectroscopy in the Infrared, Visible, and Ultraviolet, Ellipsometry, Fourier Transform Infrared Spectroscopy, Raman Spectroscopy, Luminescence, Nonlinear Optical Spectroscopy

Photoemission: Low-Energy Electron Loss Spectroscopy, Extended X-ray Absorption Fine Structure, Auger Emission Spectroscopy, Secondary-Ion Mass Spectrometry, Rutherford Backscattering

TEXT BOOK

1. Nanostructures & Nanomaterials: Synthesis, Properties & Applications, G.Cao (Imperial College Press)

REFERENCE BOOKS:

7. Nanoscale Science and Technology, R. W. Kelsall, I. W. Hamley and M. Geoghegan (John Wiley & Sons. Ltd.).

8. Nano: The Essentials, T. Pradeep (Tata McGraw Hills).

9. B.S. Murty, P.Shankar, Baldev Raj, B.B. Rath, James Murday, textbook of Nanoscience& Nanotechnology (Orient Blackswan Pvt. Ltd.)

10. Chris Binns, Introduction to Nanoscience& Nanotechnology (Wiley).

11. B.K. Parthasarathy, Nanoscience& Nanotechnology (Isha Books).

BSPH306 ELECTROMAGNETIC THEORY (Credit – 5)

Course Objective: The course incorporated in this paper will help students to

- understand the concepts of electric charge distribution and related effects.
- understand the concepts of magnetic dipoles and related effects.
- understand the basics of electromagnetic wave interaction with matter.

UNIT I

Electrostatics: Electric charges, Coulombs Law, principle of superposition, Electric field and its calculation in different symmetry (continuous charge distribution, solid sphere, spherical shell, line charge, charged ring, charged disk, electric dipole) divergence and curl of electrostatic field, electrostatic potential, Gauss`s law in integral and differential form and its applications, Work and energy in electrostatics: point charge distribution and continuous charge distribution,

UNIT II

Magnetostatics: The Lorentz force Law: magnetic fields and forces, magnetic flex density, currents; The Biot-Savart law: stesdy currents and the magnetic field of steady current; straight line currents, the divergence and curl of B, Ampere`s law and its applications, Gauss law in magnetism, magnetic vector and scalar potentials, comparison of Magnetostatics and Electrostatics, Magnetic vector potential.

UNIT III

Magnetic Fields in matter : Magnetization: Dia-, Para- and Ferromagnetism, torques and forces on magnetic dipoles, effect of magnetic field on atomic orbit, magnetization; The field of a magnetized object: bond currents and its physical interpretation, the magnetic field inside matter; The auxiliary field H: Ampere`s law in magnetized material, , deceptive parallel, boundary conditions; Linear and Non-linear media: magnetic susceptibility and permeability, ferromagnetism.

UNIT IV

The Electromagnetic Character of light: Electromagnetic wave equation, Maxwell`s Equations and their physical significance, Maxwell`s Equations for free space, velocity of EM waves, relation between refractive index and relative permittivity of medium, uniform plane waves: transverse nature, relation between E and H, characteristic impedance; Electromagnetic current density, Poynting theorem, Poynting vector, wave propagation in lossy medium, waves in conductors and dielectrics. radiation from an accelerated charge, radiation from a charge under periodic motion, Cerenkov radiation...

TEXT BOOK

1. Introduction to Electrodynamics, David J. Griffiths, 3rd edition, (Pearson Education).

REFERENCE BOOKS:

1. Electromagnetics, Joseph A.Edminister 2nd ed.(New Delhi: Tata Mc Graw Hill).
2. Fundamentals of Electromagnetics, M.A.W.Miah.(Tata Mc Graw Hill).
3. Applied electromagnetism, Liang Chi Shen, Jin Au Kong (PWS Pub. Co.).
4. Introduction to Electrodynamics, A.Z.Capri & P.V.Panat.(Narosa Pub.House).
5. Classical Electrodynamics, J. D. Jackson, 3rd edition, (Wiley, New York).

BSPH308 Project (Credit – 5)

The student will submit a synopsis at the beginning of the semester for the approval from the project committee in a specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held within two months' time. Dissertation Report must be submitted in a specified format to the project committee for evaluation purpose at the end of semester.

Elective

Student can choose any one option from the Elective* Courses which will be offered in 6th semester from the option listed below.

BSPH 322 Study of Materials

BSPH 324 Mechanical Properties of Materials

BSPH322 STUDY OF MATERIALS (Credit – 5)

Course Objective: Metallurgy and Materials deal with the structure and properties of all materials, which have engineering applications. Metallurgists and Materials Engineers are responsible for designing, producing, examining and testing materials as diverse as metallic engineering alloys, semiconductors and superconductors, ceramics, plastics and composites. This course will help students understand the properties of different types of materials and their applications.

UNIT I

Composite Materials

Large-Particle Composites, Dispersion-Strengthened Composites,fiber-reinforced composites:Influence of Fiber Length,Influence of Fiber Orientation and Concentration, The Fiber Phase, The Matrix Phase, Polymer-Matrix Composites, Metal-Matrix Composites, Ceramic-Matrix Composites, Carbon–Carbon Composites, Hybrid Composites,Processing of Fiber-Reinforced Composites.

UNIT II

Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram.

Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

UNIT III

Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth.

Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

UNIT IV

Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism and effect of corrosion, prevention of corrosion. Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites.

Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.

TEXT BOOKS:

1. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.
2. Material Science - Narula, Narula and Gupta. New Age Publishers.

REFERENCE BOOKS:

1. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi.
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons.
3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons Delhi.
4. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi

BSPH324 MECHANICAL PROPERTIES OF MATERIALS (Credit – 5)

Course Objective: The objective of this course is to make the students understand the concept of stress and strain in different types of structure/machine under different loading conditions. The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

UNIT I

Simple Stresses & Strains: Concept & types of Stresses and strains, Poison's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

Compound Stresses & Strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal- planes, Mohr's circle of stresses, Numerical.

UNITII

Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Torsion Of Circular Members: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

UNIT III

Bending & Shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams Numericals.

Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordom's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections,Numerical.

UNIT IV

Slope & Deflection: Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) A combination of concentrated loads & uniformly distributed load.

TEXT BOOKS:

1. Strength of Materials – G.H.Ryder - Macmillan, India 24
2. Strength of Materials– Andrew Pytel and Fredinand L.Singer, Addison –Wesley

REFERENCE BOOKS:

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials A Rudimentary Approach – M.A. Jayaram, Sapna Book House, Bangalore

BSPH352 BASIC PHYSICS LAB-VI (Credit – 1)

Networks

1. To verify the Thevenin, Norton, Superposition, and Maximum Power Transfer Theorem

2. To measure the Input and Output Impedance of an Unknown Network and to convert it into

Equivalent T and Pi Circuits.

Power supply

1. To study (a) Half-wave Rectifier and (b) Full-wave Bridge Rectifier and investigate the effect
of C, L and π filters.

2. To design a Semiconductor Power Supply of given rating using (a) Half wave, (b) Full wave or
(c) Bridge rectifier and investigate the effect of C-filter.

3. To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.

4. To investigate simple regulation and stabilization circuits using Voltage Regulator ICs.

Transducers

1. To determine the Characteristics of p-n junction of a Solar Cell.

2. To study the Characteristics of a Photo-diode.

3. To determine the Coupling Coefficient of a Piezoelectric crystal.

Transistor Applications

1. To study the CE Characteristics of a Transistor.

2. To study the various Transistor Biasing Configurations.

3. To design a CE Amplifier of a given gain (mid-gain) using Voltage Divider Bias.

4. To study the Frequency Response of Voltage Gain of a RC-Coupled Amplifier.

5. To design an Oscillator of given specifications using Transistors.

6. To study the Characteristics of a FET and design a common source amplifier.

Note

1. Each college should set up all the Practicals from the above list.
2. Each student is required to perform at least 8 Practicals by taking at least 2 Practicals from each of the units 506.1 to 506.3.
3. The students should be encouraged to do practicals by using Breadboard or softwares like PSpice wherever possible.

REFERENCE BOOKS:

1. GeetaSanon, BSc Practical Physics, 1st Edn. (2007), R. Chand & Co.
2. Nelson and Jon Ogborn, Practical Physics.
3. Adrian C. Melissinos, Jim Napolitano, Experiments in Modern Physics.
4. Paul B. Zbar and Albert B. Malvino, Basic Electronics (A Text-Lab Manual), Tata McGraw Hill.
5. A. P. Malvino, Electronics.
6. John Morris, Analog Electronics.
7. A P Malvino and D P Leach, Digital Principles and Applications

Annexure 'A'								
B.Sc. (H) Physics	**Year 2018-2021 (Scheme of Studies)**							**SBAS**
YEAR	**ODD SEMESTER**				**EVEN SEMESTER**			
	SN	**COURSE CODE**	**COURSE TITLE**	**Credits**	**SN**	**COURSE CODE**	**COURSE TITLE**	**Credits**
FIRST	**1**	**BSPH101**	MATHEMATICAL PHYSICS-I	5	**1**	**BSPH102**	MATHEMATICAL PHYSICS-II	5
	2	**BSPH107**	MECHANICS	5	**2**	**BSPH112**	ELECTRICITY & MAGNETISM	5
	3	**BSPH105**	OPTICS	5	**3**	**BSPH106**	OSCILLATION & WAVES	5
	4	**BSMA141**	MATHEMATICS-I	4	**4**	**BSEL101**	COMMUNICATION SKILLS	4
	5	**BSCH125**	ENVIRONMENTAL STUDIES	3	**5**	**BSEL171**	COMMUNICATION SKILLS LAB	1
	6	**BSCS113**	INTRODUCTION TO COM- PUTERS AND PROGRAM- MING	3	**6**	**BSCH120**	CHEMISTRY-I	4
	7	**BSPH153**	BASIC PHYSICS LAB-I	1	**7**	**BSMA224**	BASICS OF MATLAB	2
	8	**BSCS157**	C PROGRAMMING LAB	1	**8**	**BSPH160**	BASIC PHYSICS LAB-II	1
	9	**BSMA131**	DATA PRESENTATION FOR SCIENCES	1	**9**	**BSCH154**	CHEMISTRY LAB-I	1
	TOTAL			28	**TOTAL**			28
SEC OND	**1**	**BSPH201**	MATHEMATICAL PHYS- ICS-III	5	**1**	**BSPH202**	**MATHEMATICAL PHYSICS-IV**	5
	2	**BSPH203**	THERMAL PHYSICS	5	**2**	**BSPH204**	**NUCLEAR PHYSICS**	5
	3	**BSPH205**	CLASSICAL MECHANICS	5	**3**	**BSPH206**	**ATOMIC & MOLECULAR PHYS- ICS**	5
	4	**BSPH209**	MODERN PHYSICS	5	**4**	**BSPH208**	**QUANTUM MECHANICS**	5
	5	**BSCH207**	CHEMISTRY-II	4	**5**	**BSPH210**	**STATISTICAL MECHANICS**	5
	6	**BSCS215**	OBJECT ORIENTED LAN- GUAGE	3	**6**	**BSMA142**	**MATHEMATICS-II**	4
	7	**BSPH251**	BASIC PHYSICS LAB-III	1	**7**	**BSPH252**	**BASIC PHYSICS LAB-IV**	1
	8	**BSCH257**	CHEMISTRY LAB-II	1				
	9	**BSCS259**	OBJECT ORIENTED LAN- GUAGE LAB	1				
	TOTAL			30	**TOTAL**			30
THIRD	**1**	**BSPH301**	BASICS OF ELECTRONICS	5	**1**	**BSPH302**	DIGITAL ELECTRONICS	5
	2	**BSPH313**	BASICS OF NANO SCIENC- ES-I	4	**2**	**BSPH326**	BASICS OF NANO SCIENCES-II	4
	3	**BSPH305**	SOLID STATE PHYSICS	5	**3**	**BSPH306**	ELECTROMAGNETIC THEORY	5
	4	**BSPH311**	LOW TEMPERATURE PHYS- ICS AND VACUUM TECH- NOLOGY	5	**4**	**BSPH308**	PROJECT	5
	5	**BSPH309**	PARTICLE PHYSICS	5	**5**		ELECTIVE	5
	6	**BSPH353**	SEMINAR-I	1	**6**	**BSPH354**	SEMINAR-II	1
	7	**BSPH351**	BASIC PHYSICS LAB-V	1	**7**	**BSPH352**	BASIC PHYSICS LAB-VI	1
	TOTAL			26	**TOTAL**			26
	ELECTIVES							
	1	**BSPH322**	STUDY OF MATERIALS	5	**2**	**BSPH324**	MECHANICAL PROPERTIES OF MATERIALS	5
					TOTAL CREDITS [C]			168